MARCH, 1900. VOL. XV. No. 3.

# The Geographical Journal

INCLUDING THE PROCEEDINGS OF THE ROYAL GEOGRAPHICAL SOCIETY.

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The
Geographical Journal.

No. 3. MARCH, 1900. Vol. XV.

# A FRAGMENT OF THE GEOGRAPHY OF ENGLAND.

## SOUTH WEST SUSSEX.*

By HUGH ROBERT MILL, D.Sc., F.R.S.E.

*Introductory.*—In 1896 I proposed a scheme for a geographical description of the United Kingdom, based on the maps of the Ordnance Survey, and consisting of a separate memoir for every sheet of the map on the scale of 1 inch to a mile.† I was requested by the Royal Geographical Society to prepare a specimen memoir, and, by the advice of Sir John Farquharson, then Director-General of the Ordnance Survey, chose Sheet No. 317 of the new one-inch map of England as a fairly typical example. In order to complete the strip of coastal plain in this sheet to the sea, No. 332 was also considered, these two being, in fact, united in the special edition of the map printed in colours. The original proposal was to discuss and arrange the facts recorded by the various Government Survey and Statistical Departments, so as to bring out the regional distribution of all obtainable data regarding the country, and to indicate the influence of the forms of the land-surface upon that distribution. It was proposed to supplement the data already existing in a published form by obtaining new information, or even by making special investigations on the spot. Each memoir was to be comprehensive, authoritative, and brief, and every group of memoirs when completed for a natural region was to be summarized, so as to give a general description of the whole, and ultimately combined and condensed to form a handbook of the geography of the British islands as a whole. The question of the staff required for the production of the memoirs was not dealt with. The

* Read at the Royal Geographical Society, February 5, 1900.

† *Geographical Journal*, vol. vii. (1896), p. 345.

attempt to fill up the skeleton-plan of a memoir according to the original design has naturally brought various practical difficulties into relief, and the work done upon it, being merely an incident in other work of greater immediate urgency, is neither so complete nor so satisfactory as it ought to be. However, it has shown that the execution of the scheme is possible, and I believe that the following specimen memoir will allow the desirability of carrying out the original suggestion to be fairly considered, and decided upon one way or the other.

The treatment of maps and the study of the district on the spot is easy, and need not be further referred to; but the treatment of unmapped statistics is extremely laborious, and in the following memoir very incomplete. For instance, with regard to most statistics, the mean of a series of years should be worked out; but I have been able only to take the figures of a single year as a specimen. So also I have been unable to obtain the highest accuracy possible in the measurements on the maps, from want of time to repeat the work according to different methods. On this subject, however, a special report has been made.

If the importance of cartographical representation could be brought home to the various government statistical departments, it would lead to an immense increase in the value of their work, and enormously facilitate reference to it. If the census returns, the agricultural returns, and the Registrar-General's reports, to take a few examples, were mapped even on the scale of 10 miles to an inch, the conditions and resources of the country could readily become known to any student; as things are it would require a lifetime to obtain correct ideas of the general condition of the country in any one particular.

Two important matters on which stress was laid in the original plan have had to be almost ignored. One is the distribution of disease and causes of death, for which ample data exist; the other is the treatment of historical and archæological subjects. These are so important, the number of persons interested in them is relatively so large, and the literature is so extensive, that I fear they must be treated separately. Only the largest features and the most generally accepted facts can be included in a short summary.

While presenting this work, I have to acknowledge the greatest possible help from several Government departments and individuals, amongst whom it is a pleasure to mention and to thank Colonel Sir John Farquharson and Colonel D. A. Johnston, the successive Directors-General of the Ordnance Survey; Sir Archibald Geikie, Director-General of the Geological Survey and the staff of the office in Jermyn Street, especially Messrs. Clement Reid and Lamplugh; Major Craigie, of the Board of Agriculture; Mr. G. J. Symons, for his rainfall statistics; Mr. B. V. Darbishire, for help with measuring areas on the contoured maps; and Mr. J. Vincent Elsden, Storrington, for the use of his excellent photographs.

I may add that the plan of carrying on the work suggested in 1896 still appears to be sound, and the practical experiment has confirmed my belief in its importance and its practicability. As to its ultimate object, it may be allowable to quote from the earlier paper:—

"In my opinion the important practical point is that, in the prospect of increasing agricultural depression, and in prevision of the certainty of the ultimate recovery in the value of land in the British Islands when the fields of America, Russia, and India cease to yield a paying return at low prices, it is absolutely essential to have a trustworthy account of the actual conditions and resources of our own country. The account would in some degree correspond to Sir John Sinclair's 'Statistical Account of Scotland' of a century ago; but would, of course, have the advantage of a more systematic plan and far more numerous and more exact data. It will not be so very many decades before waterfalls will rival coal-mines in industrial value, and the tidal bore in an estuary will determine a centre of dense population. The study of the country in the light of scientific geography will then be a vital necessity, and it is our duty as geographers to see that we hand on our science as an efficient implement for the needs of a later age.

"I have little doubt that in the coming century the generalizations of geography will find a multiplicity of applications in economic, political, and social life, which will be of the utmost national importance. Even now we recognize instances, economic, political, and social, where ignorance or neglect of geographical principles has led to results which may fairly be called national misfortunes. I feel sure that some such scheme as that set forth in this paper will provide in its elaboration the means for greatly advancing geography and perfecting its theory; and on its completion will form a mass of geographical information which will retain a permanent value."

## Memoir to Sheets 317 and 332.

*Position.*—Taking the position to the nearest minute of latitude, the region covered by Sheets 317 and 332 of the Ordnance Survey 1 : 63,360 map (1 mile to 1 inch) extends from 51° to 50° 43′ N., and from 0° 26′ to 0° 50′ W. The central parallel is 50° 51′, a position corresponding to a longest day of 16 hours 26 min. and a shortest day of 7 hours 52 min. The length of a degree of longitude on this parallel is 43·714, and that of a degree of latitude 69·126 statute miles. The northern slope of the Downs is the only part of the district which is turned away from the direct rays of the sun.

*Configuration.*—The area covered by Sheets 317 and 332 includes three sharply contrasted natural regions, the dividing lines of which run east and west: (1) the plain or flat valley through which the river West Rother flows eastward to the Arun, on the north; (2) the elevated land of the South Downs; and (3) the coastal plain. The two plains are

united by the gorge of the Arun, which cuts across the line of the Downs from north to south; and further west there is an easy pass across the Downs leading from Cocking to Chichester formed by two valleys. These depressions cut the ridge of hills into three distinct parts. The general features are brought out by the sketch-map, Fig. 6.

The mean altitude of the land is 150 feet above sea-level, for an area of 270 square miles. The mean depth of the sea below low-tide level is 46 feet for an area of 162 square miles. The areas of land lying between given limits of height, and of water lying between given limits of depth, are in square miles, acres, and percentage of the whole area of land or sea respectively:—

TABLE I.—AREAS OF LAND AT DIFFERENT ELEVATIONS.

| Elevation. | Square miles. | Acres. | Per cent. of land. |
|---|---|---|---|
| Above 800 feet ... ... ... | 0·05 | 32 | 0·02 |
| 700–800 „ ... ... ... | 1·7 | 1,088 | 0·63 |
| 600–700 „ ... ... ... | 4·25 | 2,720 | 1·50 |
| 500–600 „ ... ... ... | 9·5 | 6,080 | 3·52 |
| 400–500 „ ... ... ... | 15·5 | 9,920 | 5·73 |
| 300–400 „ ... ... ... | 20·0 | 12,800 | 7·40 |
| 200–300 „ ... ... ... | 9·0 | 5,760 | 3·33 |
| 100–200 „ ... ... ... | 66·0 | 42,240 | 24·44 |
| 50–100 „ ... ... ... | 43·0 | 27,520 | 16·03 |
| 0–50 „ ... ... ... | 101·0 | 64,640 | 37·40 |
| Total ... ... | 270·0 | 172,800 | 100·00 |

TABLE II.—AREAS OF SEA AT DIFFERENT DEPTHS.

| Depth. | Square miles. | Per cent. of sea. |
|---|---|---|
| Beach covered at high water ... | 5·0 | 3·09 |
| Low-tide mark to 25 feet ... .. | 32·0 | 19·75 |
| „ 25–50 „ ... ... | 61·0 | 37·65 |
| „ 50–75 „ ... ... | 42·5 | 26·23 |
| „ 75–100 „ ... ... | 20·0 | 12·34 |
| Over 100 „ ... ... | 1·5 | 0·93 |
| Total ... ... | 162·0 | 100·00 |

These tables show that, while there are 101 square miles of land along the coast less than 50 feet above sea-level, there are 98 square miles of sea along the coast with a less depth than 50 feet. When the small area of land below 50 feet north of the Downs is deducted, there appears to be just as much land as there is sea-bed within 50 feet of sea-level. More than three-quarters of the land lies at less elevations than 200 feet. It is to be particularly noticed that there is a smaller area of land

between 200 and 300 feet than in any other hundred feet interval of height until 600 feet is reached.

The contour-line of 50 feet, which forms the upper limit of the land below 50 feet in elevation, runs nearly from west to east across the southern part of Sheet 317 (Sheet 332 having no land at so high a level); but at the place where the Arun crosses the South Downs, the contour line runs northward, bounding the low land on each side of the river. The land below 50 feet is thus divided into the *coastal plain*, entirely south of lat. 50° 51′ and the *river plain*, which has a less regular form and much smaller area. The surface of the river plain is entirely covered with alluvium deposited by the stream in its meanderings. The coastal plain is mainly composed of Tertiary strata like those of the London basin, consisting of various sands and clays, although Chalk occurs in the east; but the whole is covered for the most part with drift composed of later gravels and brick-earth. Above the level of 50 feet these formations thin away rapidly, until about the elevation of 150 feet the solid Chalk of the South Downs appears at the surface. The Downs are composed entirely of Chalk, but the valleys which penetrate them from the south are carpeted with valley gravels. From the coastal plain the land rises comparatively gently (with a mean gradient above 300 feet of about 1 in 17) to the nearly flat summit; but towards the north the slope is much more abrupt (averaging, down to 300 feet, 1 in 3), plunging down to the plain of the Rother. This steep slope stops at an elevation of about 300 feet (near the transverse valley of the Arun not until a lower level), and here the Chalk ends, and the Rother valley is composed of a narrow terrace of the Upper Greensand, which at

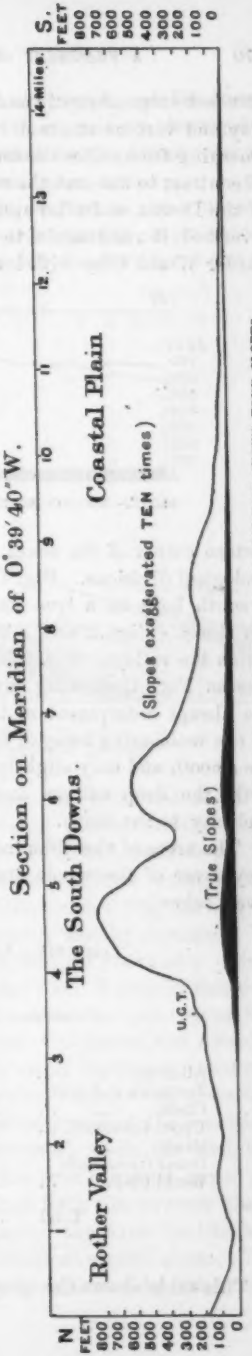


FIG. 1.—SECTION ACROSS DISTRICT FROM NORTH TO SOUTH—THE BLACK PORTION SHOWS TRUE SLOPES.

200 feet stops abruptly and gives place to wide parallel belts of Gault clay and various strata of the Lower Greensand, each successive belt emerging from under the foregoing. The surface is broken and irregular in contrast to the smoothness of the coastal plain and the rounded forms of the Downs, and after sinking to the level of 50 feet or under in the river bed, it rises again to the north to heights of over 400 feet, the harder Weald Clay with included Horsham stone occupying the north-

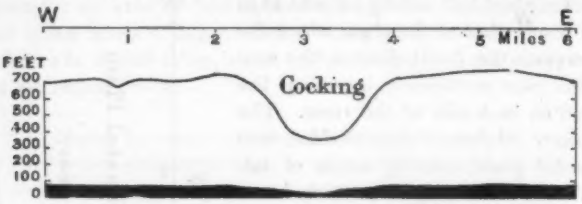


FIG. 2.—SECTION ALONG RIDGE OF DOWNS ACROSS COCKING PASS.

eastern corner of the sheet. The sketch-map, Fig. 7, shows the main geological divisions. Fig. 1 shows the profile of the country from north to south both on a true scale and with the vertical scale exaggerated ten times. Figs. 2 and 3 show sections along the crest of the Downs across the valleys. Fig. 2 is a typical geological section along the same line as Fig. 1, showing how the successive beds crop out, and how the abrupt escarpment of the Chalk Downs facing the north is formed by the weathering away of the steep edge of the gently sloping stratum, the smooth and only slightly undulated outline of the slope contrasting with the deep valleys and long spurs which diversify the gentler declivity to the south.

The areas of the different geological formations, and the percentage they cover of the whole area of the land included in the sheets, are given below:—

TABLE III.—AREA OF GEOLOGICAL FORMATIONS.

| Formation. | Area, square miles. | Area, acres. | Percentage of area. |
|---|---|---|---|
| Alluvium ... ... ... ... | 22 | 14,080 | 8·1 |
| Tertiaries and drift ... ... | 92 | 58,880 | 34·1 |
| Chalk ... ... ... ... | 79 | 50,560 | 29·3 |
| Upper Greensand ... ... ... | 7 | 4,480 | 2·6 |
| Gault ... ... ... ... | 15 | 9,600 | 5·5 |
| Lower Greensands ... ... | 48 | 30,720 | 17·8 |
| Weald Clay... ... ... ... | 7 | 4,480 | 2·6 |
| Total ... ... | 270 | 172,800 | 100·0 |

This table shows the preponderance of soil formed from drift and

Tertiary sands or clays like those of the London basin, and the insignificant area of the Upper Greensand which, as will be shown presently, plays a very remarkable part in determining the distribution of the population north of the Chalk escarpment.

*The Coastal Plain.*—The declivity of the Downs on the southern side, although broken by valleys and spurs, becomes increasingly gradual as the Chalk dips below the overlying Tertiary formations,

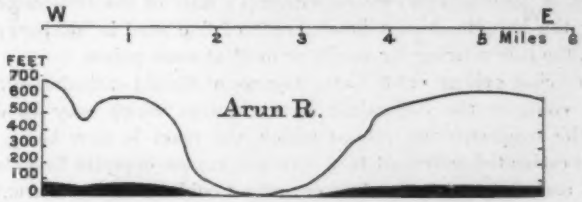


FIG. 3.—SECTION ALONG RIDGE OF DOWNS ACROSS ARUN GORGE.

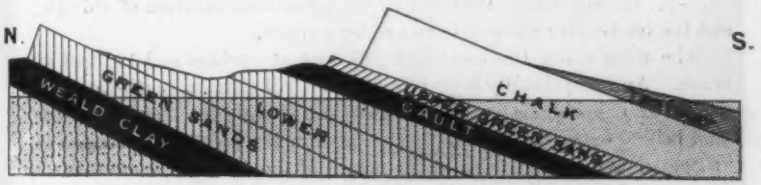


FIG. 4.—GEOLOGICAL SECTION FROM NORTH TO SOUTH.
(SHOWING STRATA OUT OF WHICH THE SCENERY IS CARVED).

*i.e.* from 300 feet down to 50 feet. Below this level the slope is very slight indeed, the actual coast-line being formed for the most part by beds of clay, mounds of shingle, or drifted sand from 10 to 25 feet high. Inland, however, there are several considerable depressions. The gravel ridge at Selsey Bill, which forms the site of Selsey, is cut off from the mainland by a narrow marshy depression in part below sea-level, through which a little channel practically unites the sea at Pagham with the sea at Bracklesham Bay. Formerly this was a broad tidal marsh difficult to cross, emphasizing the isolation of the peninsula of Selsey. The bed of the disused Chichester and Arundel canal runs west and east from the tidal Chichester channel to the Arun river at an elevation of about 20 feet, somewhat higher land occurring to the south. The clays of the Tertiary formations and the overlying drift form excellent soil and are highly cultivated, while the lowlying marsh lands yield pasture. Throughout the whole coastal plain the underlying Chalk has been reached in borings for wells, in some places more than 300 feet below the surface. East of the Arun the Chalk is covered with drift only, and comes to the surface at several places. The Chalk foundations of the coastal plain have been formed by the erosion

of somewhat disturbed strata, and the drift laid down upon them by the action of sea-ice coming from the south.*

The coast-line formed by a gravel beach, above which a low clay cliff rises at some places, is undergoing great erosion. Off Selsey Bill a line of banks covered by less than 25 feet of water, traces out an earlier coast-line running parallel to the present shore and about 5 miles distant from it. Along the coast to the eastward the depth of 25 feet is reached everywhere within $1\frac{1}{4}$ mile of the low-water line. Below the shingle slope a broad beach of fine sand is laid bare at low water, the tide retiring for a mile or more at some points.

Historical evidence of the submergence of the old cathedral of Selsey amply confirms the deductions as to erosion which may be drawn from the map, and the rate at which the coast is now being eaten back is estimated at from 6 to 8 feet per annum opposite Bracklesham Farm, and from 10 to 13 feet opposite Cockham Manor Farm.† At Pagham the old tidal harbour of 750 acres in extent was reclaimed in 1875–77, the sea being kept out by the great accumulation of shingle, and the land-water allowed to escape by a sluice.

The tides along the coast rise $16\frac{1}{2}$ feet at springs and $12\frac{1}{2}$ feet at neaps. An exceptionally high tide, especially if a strong south-westerly wind is also blowing, is apt to wash away the shingle beach and leave the land behind exposed to inundation. Between the embanked promenade at Bognor and the sandhills at the mouth of the Arun there are several places where the land is below high-tide level, and artificial banks have been built to keep the sea from the fields. At Felpham and Middleton much damage has been done by storms, the old churchyard of the latter parish having been washed away. The parish of Climping, at the mouth of the Arun, west of the river, includes about 80 acres, formerly part of the old parish of Cudlawe, or Cudlow, the greater part of which has been washed away, the site of the parish church being now occupied by 2 fathoms of water.‡

Along almost the whole shore included in the sheet, groynes of timber, or even of solid masonry and cement, have been erected at close intervals, running down the beach at right angles to high-water mark. Their object is to prevent the shingle and sand from being washed along the shore from west to east, and to cause accumulations against the weather side of the obstructions and so to pile up a defensive wall. The number of old groynes to be seen almost buried in the sand, shows that this method of combating the loss of land by erosion is a sound one (see photograph, Fig. 5).

The streams of the coastal plain are small and indefinite. River-

* 'Memoir on Sheet 332 of the Geological Survey,' by Clement Reid.

† Report on Coast Erosion. 'British Association Reports,' 1895, p. 374.

‡ Kelly's 'Directory of Sussex.' 1899.

FIG. 5.—THE BEACH AT LITTLEHAMPTON, SHOWING GROYNES.
*(From a photograph by Frith and Co., Reigate.)*

action produces no change or indentation in the coast-line. The Arun is the one important river in the area, and it flows into the sea directly, without an estuary. The width between the western breakwater and the low eastern wall which define its mouth is 120 feet. At low water there is a depth of only 2 feet of water all across the river at some places in Littlehampton, but above the town a depth of from 4 to 5 feet is found as far as Arundel. At high-water springs the depth at Littlehampton is 17 feet, and at Arundel from 15 to 16 feet; the rise at Arundel being 10 feet at springs and 7 feet at neaps. The river is embanked against floods on both sides all the way from Littlehampton to Arundel.

*Dangers to Navigation off the Coast.**—The 5-fathom line south of Selsey Bill runs 3½ miles from the shore, with no channel deeper than 3¼ fathoms within it. The dangers to navigation, known by the general name of the "Owers," are defined by a line of narrow shoals running due south from Medmerry Farm for 3½ miles, known as the Streets, the Brake or Cross Ledge, and the Boulder bank. These have less than 2 feet of water over them at ordinary low water of spring tide. A reef of rock, the Mixon, marked by a beacon, lies one mile south of Selsey Bill, and at low water of spring tides it is connected with the shore and with the Streets by dry sand, although a large pool of water over 2 fathoms deep and three-quarters of a mile in diameter is enclosed opposite the road at Selsey beach.

The Pullar bank runs east from the Boulder bank, and is continued by the Middle Ground, forming a series of shoals extending 4 miles to the eastward, and coming to within 2 feet of the surface in places at low water. A channel, the Swash or Swashway, leads through between the Middle Ground and the group of shallow banks lying farther east, known as West Head, East Borough Head, and the Outer Owers. The Outer Owers falls off abruptly into deep water, especially at the Elbow, its southern point, and the Owers lightship is anchored 1½ mile south of the shallowest part in 18 fathoms. Between the line of shoals from the Boulder to the Owers and the edge of low water at the Mixon, there is a stretch of water over 4 fathoms, and in places over 6 fathoms deep, the western part of which is called the Looe Stream, which leads with a very narrow channel between the Boulder and the Street shoals. In the east the Looe Stream merges into the Park, the area of water between 4 and 8 fathoms deep in Pagham bay forming the anchorage east of Selsey and south of Bognor. It is a fine anchorage ground, being composed of stiff clay under a thin layer of gravel, but it is dangerous in southerly or easterly winds. Both the Swashway and the Looe Stream are dangerous channels, on account of the tidal streams and the absence of clear leading marks for navigation. Chichester cathedral

* From the Admiralty Chart and 'Sailing Directions.'

spire and the little churches and large windmills on the coast are almost the only marks which exist. The regular course for vessels navigating the English Channel passes about 4 miles south of the Owers lightship, and does not come within $8\frac{1}{2}$ miles of land in any part of the coast included in the sheet, the general rule laid down in the 'Sailing Directions' being to keep to seaward of the 10-fathom line. Hence only the distant topmasts of the Channel shipping can be seen by an observer on the shore.

The contrast between the three headlands of Selsey Bill, Beachy Head, and Dungeness, which look not dissimilar on a political map of England, is remarkable: the Tertiary clays and sands eaten away to form Selsey Bill shoal the sea for miles; the lofty chalk cliff of Beachy Head has been cut back, leaving deep water in the sea; while the gravel banks of Dungeness have been built out by the action of the currents until they have reached deep water, and the largest vessels can come close up to the shore.

*The South Downs.*—Measured between the contour-lines of 300 feet on the north and south, the South Downs form a great sheet of Chalk 4 miles wide in the western half, 3 miles wide in the eastern, and stretching east and west across the whole breadth of the sheet. The geological section (Fig. 4) distinguishes between the steep and uniform escarpment facing the north and the long dip-slope emerging from its covering of Tertiary deposits which faces the south. The uniform northern slope, which presents a bold and almost mountainous aspect when viewed from the plain, trends from the west slightly south of east as far as Barlavington, where it turns at right angles and runs south nearly 2 miles to Cold Harbour Farm, the steep slope facing eastward, and there it turns again at right angles and runs east by south to the edge of the sheet. This rectangular intrusion of the plain into the Downs may be called, for convenience, the Bignor embayment. A similar abrupt turn to the north occurs 24 miles farther east, and the structure is probably to be explained by a fold in the strata. The three parts into which the portion of the Downs included in this sheet is divided by north and south valleys are all deeply carved into valleys and combes, between which rise broad rounded summits, characteristically capped with trees. In all three parts the culminating altitudes form a nearly level undulating strip of land immediately overlooking the northern escarpment. In all, also, there is the absence of running water characteristic of the Chalk. There are neither streams nor springs, and during rain the porous soil rapidly soaks up the moisture. The origin of the dry Chalk valleys is ascribed by Mr. Clement Reid to the end of the Glacial Period, when the whole mass of the Chalk was frozen into hard and impervious rock in which the torrents resulting from the melting of the higher snow cut out the valleys.

The valley of the Lavant on the west, if we define it by the 300-foot

contour-line, carries its head within a mile of the plain to the north, and forms a natural line of communication between south and north. The portion of the Downs to the west included in the sheet is hollowed on its southward slope into a series of long valleys converging southward on that of the Lavant.

The central portion of the Downs, between the valley of the Lavant and the flat-bottomed trench which the Arun has cut across the Chalk, measures 9 miles in length. It contains in Duncton Down the highest point (837 feet) in this sheet, and within 20 feet of the culminating point of the South Downs. No large valley runs eastward from the Downs to the trench of the Arun, but a very remarkable dry valley (which may be called the Dean valley) runs westward, commencing at an elevation of 420 feet, under the shadow of Duncton Down, and running for 5 miles until it enters the Lavant valley at an elevation of 200 feet. A tongue of drift from the coastal plain runs up this valley for a considerable distance, carrying a strip of fertile ground into the very heart of the Chalk country. To the south the Dean valley is bordered by a fairly uniform ridge of down (500 to 750 feet high), from which only short valleys descend to it; but from the north it receives longer and deeper lateral valleys. The southern ridge is itself deeply cut into broad south-sloping valleys, or combes, separated by bold ridges. The southern extremities of these ridges occasionally form small isolated hills, and the southern slope, as a whole, is the most varied and picturesque of the Chalk scenery. The covering of soil over the greater part of the Downs is so thin that when the turf is cut the white Chalk gleams through, and on the unfenced uplands the boundaries between the pasturage of neighbouring farms is marked by cutting a shallow trench into the Chalk.

The eastern portion of the Downs included in the sheet forms nearly half of the block of heights, measuring 9 miles in length, which lies between the deep-cut valleys of the Arun and the Adur. It is in every way similar to the other portions; steep and uniform to the north, where it rises over the plain, and cut into long valleys, ridges, and nearly isolated rounded hills on the south.

*The Rother-Arun Valley.*—The portion of the broad valley lying north of the South Downs which falls within this sheet belongs almost entirely to the drainage area of the Arun. The eastern edge of the sheet coincides almost exactly with the watershed between the Arun and the Adur, about 2 miles of one upper tributary and 1 mile of another flowing eastward being alone included.

The geological structure is very simple, consisting of the outcrops of the gently dipping strata appearing one from beneath the other as one goes from south to north, and forming a series of belts, running on the whole from west by north to east by south, parallel to the strike of the Chalk escarpment. Close at the base of the escarpment the Upper

Greensand forms a sort of terrace between the altitudes of 300 and 200 feet in the west, where at Elsted it is a mile wide, but gradually diminishing in breadth to less than a quarter of a mile at Graffham, where the Chalk begins to descend lower, and the level of the Upper Greensand sinks to between 200 and 100 feet, and expands to a mile in width, corresponding to its diminished slope, in the Bignor embayment. Where it emerges from under the Arun alluvium the Upper Greensand terrace on the eastern block of the Downs is from a half to a quarter of a mile wide, and gradually rises eastward from 50 to 250 feet in average elevation. This Greensand terrace forms everywhere a porous sandy soil, in which water is readily found by sinking wells, as it is prevented from percolating away by the impervious stratum of Gault clay which underlies it. At the outcrop of the Upper Greensand along the northern edge of the Chalk escarpment there is a row of natural springs formed by the escape of the water which has percolated through the porous strata of the Chalk. A number of small streams accordingly take their rise on the Upper Greensand terrace, and flow out over the clay and Lower Greensand, the whole valley being richly supplied with clear running brooks, in contrast to the sluggish ditches of the coastal plain and the waterless stretches of the Downs. The belt of Gault averages a mile in width on the west of the Arun, except in the Bignor embayment, where the general lowering of the surface has exposed it to a much greater extent; but along the eastern block of the Downs it is less than half a mile wide.

The centre of the valley and the northern slope is occupied by various beds of the Lower Greensands, which in the north reach elevations of 400 feet, and are deeply carved into picturesque hills and dales. The Folkestone beds, which come out from under the Gault, form a soil so unproductive that the belt forms an almost unbroken succession of commons, warrens, and parks between the cultivated lands of the Gault on the south and those of the Sandgate and Hythe beds on the north, through which the river flows.

In the north-eastern corner of the sheet the Lower Greensands form a distinct escarpment, though not so high nor so sharply defined as that of the Chalk, overlooking the Weald Clay, which comes up from beneath them. This is part of the great curved escarpment, bounding the central Weald, of which Hindhead and Leith Hill are the most prominent features on the west and north of the curve. The crest of the southern part of the Lower Greensand escarpment runs just to the north of the district shown in Sheet 317.

Speaking generally, the Rother valley slopes downwards gently to the east, at an average gradient of 1 in 700, as far as the Arun; while east of the Arun a short and relatively steep slope to the west, averaging 1 in 132, leads down to the river from its watershed with the Adur.

*The Rivers and Streams of the District.*—The area of the standing and

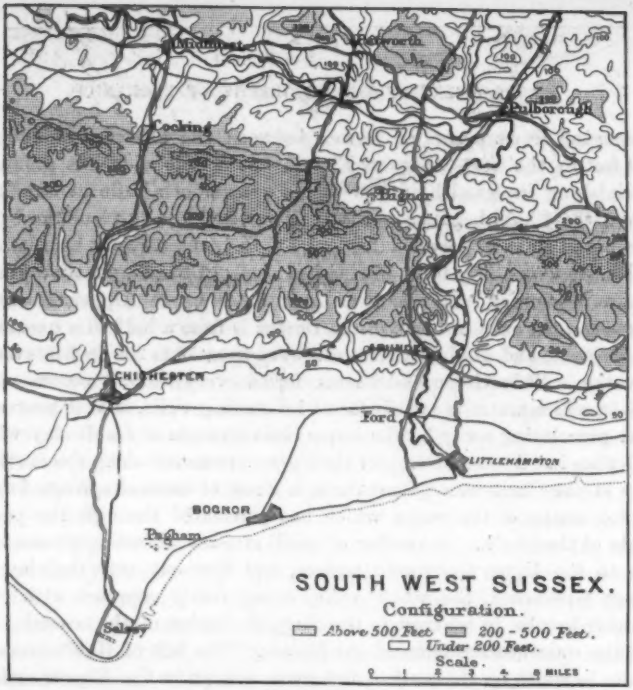
Haslemere
Petworth
Pulborough
Cocking
Midhurst
ARUNDEL
CHICHESTER
Ford
LITTLEHAMPTON
BOGNOR
Pagham
Selsey
SOUTH WEST SUSSEX.
Configuration.
Above 500 Feet.
200 - 500 Feet.
Under 200 Feet.
Scale.
0 1 2 3 4 5 MILES

FIG. 6.

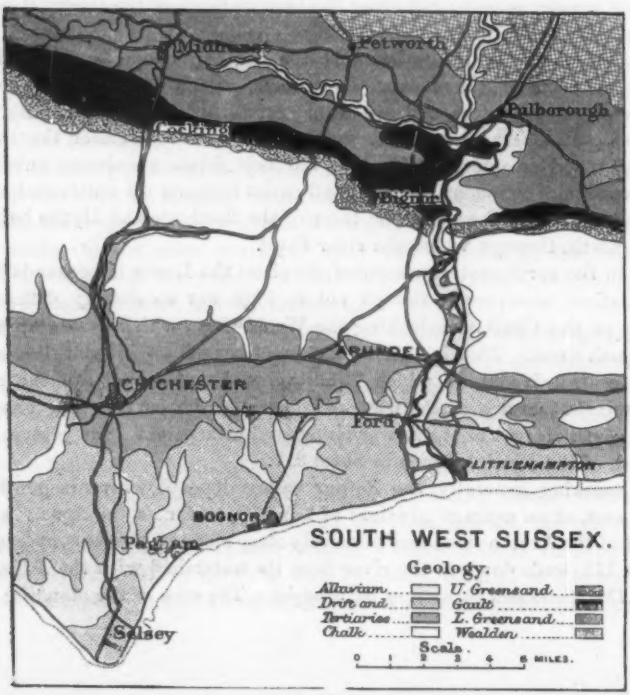
Petworth
Pulborough
Midhurst
Cocking
Haslemere
ARUNDEL
CHICHESTER
Ford
LITTLEHAMPTON
BOGNOR
Pagham
Selsey
SOUTH WEST SUSSEX.
Geology.
Alluvium
Drift and
Tertiaries
Chalk
U. Greensand
Gault
L. Greensand
Wealden
Scale.
0 1 2 3 4 5 MILES.

FIG. 7.

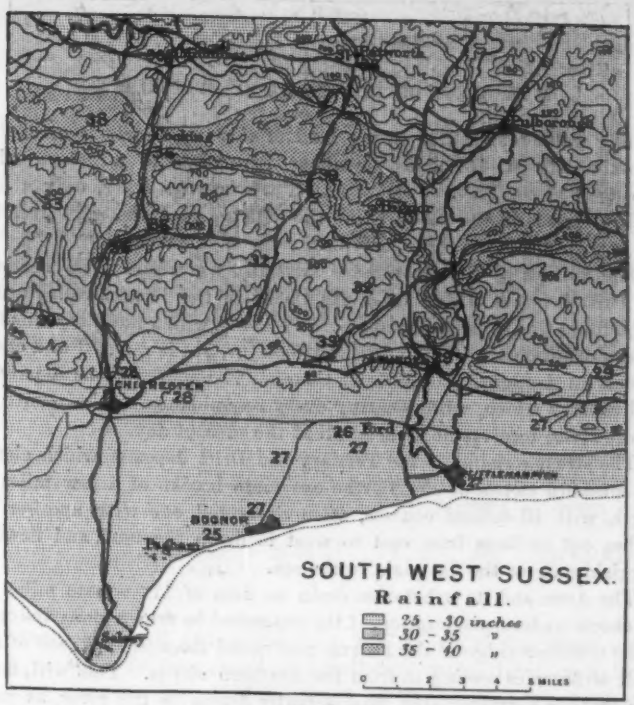
SOUTH WEST SUSSEX.
Rainfall.
25 - 30 inches
30 - 35 "
35 - 40 "
0 1 2 3 4 5 MILES
CHICHESTER
BOGNOR
LITTLEHAMPTON
Ford
Petworth
Cocking
Midhurst
Pulborough
Arundel
Selsey

FIG. 8.

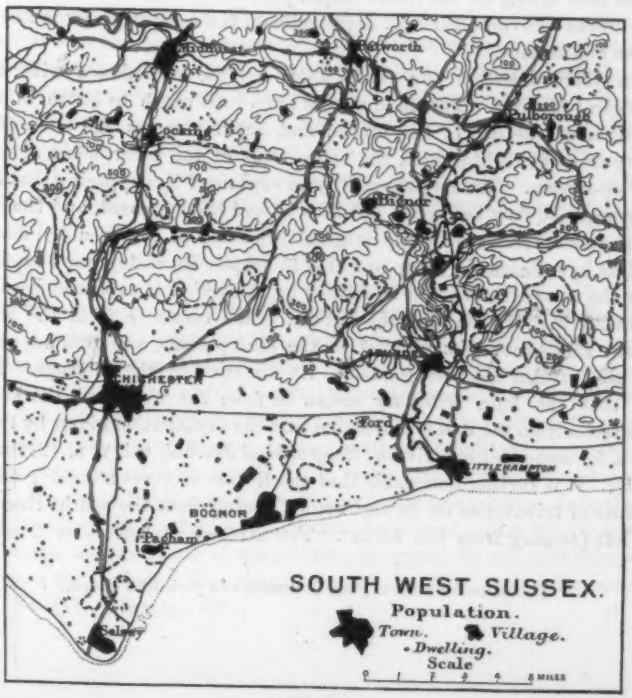
SOUTH WEST SUSSEX.
Population.
Town.
Village.
Dwelling.
Scale
0 1 2 3 4 5 MILES
CHICHESTER
BOGNOR
LITTLEHAMPTON
Ford
Petworth
Cocking
Midhurst
Pulborough
Arundel
Selsey

FIG. 9.

running water represented on the land of the two sheets is estimated approximately at 414 acres, or about two-thirds of a square mile, forming 0·25 per cent. of the land. There are no lakes, only a few artificial ponds in the parks or at the villages, and the only river of any importance is the Arun, a typical river of the Weald.

The valleys of the Downs are typically waterless. The Tertiary and Drift deposits which cover the Chalk in the Lavant valley allow of the formation of a small stream, the Lavant, which flows towards the estuary of Chichester Channel in wet weather, but is reduced to a chain of pools in drought.* Chichester Channel is remarkable as a narrow tidal estuary which, while bearing every resemblance to the mouth of a large river, receives no river at all at the present day.

The streams rising on the Tertiary and Drift deposits which clothe the southern slopes of the Downs are mere brooks of a few miles in length, with ill-defined courses, often connected one with another by ditches cut in lines from east to west to drain the land, and flowing sluggishly across the flat plain to the sea.

The Arun and its tributaries drain an area of 112 square miles on the sheets under consideration, if the watershed be drawn along the crest of the northern ridge of the Downs, and round the source of each of the small tributaries coming in from the southern slopes. This will, however, include a greater area than actually drains to the river, as most of the rain falling on the Chalk slopes percolates into the mass of rock, and, unless recovered through deep wells on the coastal plain, is lost to use on the surface.

In their direction the rivers show a close accordance with the geological features. The main stream runs from north to south in the direction of the dip of the strata, and cutting across the successive escarpments at right angles, the steep cliffs of the escarpment always look up-stream. This might possibly be explained by supposing that the river began to flow before the lower rocks had been exposed, and that its course was determined by the original dip-slope of the Wealden dome. On this hypothesis the river was able to deepen its valley more rapidly than the escarpments could be formed by the action of subaerial erosion.

But it will be seen that the Rother, which comes in from the west to join the Arun, runs parallel to the escarpments, and this suggests that that stream has been guided in its direction by the outcrops. The fact that the long tributary comes in from the west and the short tributaries from the east is noticeable, and the explanation given by Prof. Davis for some English rivers (*Geographical Journal*, vol. v. p. 127) may apply. It is further noticeable that the Rother receives a much greater number of tributaries on its right side (coming from the south) than on the left (coming from the north). Ten streams at least, over 2 miles

* The name *lavant* is applied in Sussex to a periodical stream.

in length, come in from the south, and only five from the north, although those from the north are longer. The explanation seems to be that springs at the base of the Chalk are more numerous than on the dip-slopes of the Lower Greensands, which form the northern versant, and the rainfall also is heavier.

In the following table the lengths of the rivers are given only to the edge of the sheet, except for the upper part of the Rother, three short windings of which are taken from the sheet to the north for the sake of completeness. It is to be remembered that a greater length of both rivers is found on other sheets.

TABLE IV.—LENGTHS OF RIVERS.

| River. | Distance in direct line. Miles. | Length by windings. Miles. | Ratio length to distance. | Length for navigation. Miles. | Point to which navigable by barges. |
|---|---|---|---|---|---|
| Arun ... ... | 14·25 | 25·25 | 1·8 | 20·0 | All the way |
| Rother ... ... | 14·0 | 19·6 | 1·4 | 12·0 | Midhurst |

Where the Arun enters the sheet the surface of the water cannot be more than 10 feet above the Ordnance datum level, as a bridge crossing the river has the bench-mark of 21 feet, and is probably not less than 11 feet above the water. The river plain, measured between the contour-lines of 50 feet, is half a mile wide at this point, but contracts to less than a quarter of a mile in the gorge cutting across the Lower Greensand escarpment, just before the Rother joins and the river turns eastward below the ridge on which Pulborough stands. Here the first of the great windings of the river traverses a flat expanse of reclaimed or marshy ground, which a very moderate blocking of the gorge through the Chalk would convert into a lake of about 4 miles diameter. The greater part of this area is covered with alluvial deposits, formed as the river changed its course on the nearly level ground, and it is liable to be flooded in winter.

The gorge through the Chalk averages three-quarters of a mile in width between the contours of 50 feet, although at one point, at Houghton, this is reduced to less than half a mile, and heights of 200 feet on opposite sides of the valley are less than a mile apart. The river traverses its flat gorge in windings which carry it three times against the solid Chalk on the left side and twice on the right, so that it cuts white cliffs along its course. The cutting is most marked south of Houghton, where the river runs close under the chalk cliff for 1½ mile, forming a semicircular sweep with a radius of half a mile from North Stoke as a centre. Into the concavity of every winding a fan-shaped terrace of valley gravel projects from the opposite side of the valley, uncovered by the alluvium which carpets the bottom. The sharp loops of the river have been connected

FIG. 10.—"HE VERY GOOD LOOKING MOTHER FROM MONTREAL."
(From a photograph by Mr. C. Jones, Montreal.)

by artificial channels to shorten the distance for barge navigation, thus forestalling the natural process of river change. On emerging from the Downs at Arundel, the river flows in gentle curves southward across the coastal plain to the sea.

The canal cutting off the large curve of the Arun near Watersfield had a lock $11\frac{1}{2}$ miles by the barge channels from the sea; and another lock was built at Pillingham, 4 miles higher, where barges left the river and entered the canal that led to the Wey at Guildford, and so to the Thames. This canal is no longer in use. The influence of the tide is felt as high as Pillingham lock on the Arun, $23\frac{1}{2}$ miles from the sea by the windings, and $13\frac{1}{4}$ in a direct line. On the Rother it is felt as far as Hardham Mill only.

*Roads and Railways.*—The roads of the district show only a limited relation to the natural features, which indeed are only in two cases pronounced enough to exercise much determining influence. One case is the steep escarpment of the Downs which limits the number of convenient crossing-places from north to south; the other is the marshy valley of the Arun, which practically closed that opening to high-roads.

The coastal plain is traversed by roads in every direction, most of them designed for local purposes, and serving to connect the farmhouses with the chief centre of the parish. Hence it is rarely that a road runs more than a mile without a turn at right angles, and a journey by road along the coast involves many abrupt turns and *détours*. The chief high-road from west to east runs through Chichester and Arundel, rising in its highest points, at several places, over 100 feet. Chichester, from its historic position, forms the natural centre of roads, the existing system being derived from that of the Romans. The surface of the roads in the south is usually good, being formed of flint, broken small, and marine gravel.

The roads across the Downs usually follow either valleys or spurs. At least nine well-made roads penetrate the Downs from the south, but only four emerge on the north. The Downs, however, are traversed in every direction by cart-roads and paths, the wheel-ruts showing the white of the Chalk through the general covering of turf.

The plan of Chichester is formed by two main streets crossing at right angles. The street running east and west is part of the South Coast high-road which runs from Southampton to Brighton, through Chichester and Arundel. The second, running from south to north, is part of the road which comes from Selsey Bill, and continues northward up the Lavant valley to the culminating point at 321 feet; and then, descending steeply, leaves the Downs at Cocking, crosses the plain by Cocking Causeway to Midhurst, and continues northward to Haslemere and Guildford. A branch from this road runs up the Dean valley through the very heart of the Downs to Up Waltham, where it joins the diagonal road which, starting north-eastward from Chichester,

FIG. 10.—THE ARUN GORGE, LOOKING NORTH FROM HOUGHTON.
(From a photograph by Mr. J. Vincent Elliston.)

on the site of the ancient Roman Stane Street, diverges northward at 200 feet near Seabeach, and crosses the southern ridge of the Downs at 502 feet. From Up Waltham it continues up the valley, crosses the main ridge of the Downs at 495 feet, and descends steeply to the plain at Barlavington, whence it runs northward to Petworth and on to Guildford.

The third road crossing the Downs may be viewed as the continuation of that from Bognor; it leaves the Chichester-Arundel high-road at Westergate, and runs up the steep and picturesque valley known as Rewell Hill, where, at an elevation of 322 feet, it meets the fine highway from Arundel, which has come up on the back of a long spur. The two roads cross; one descends the steep eastward escarpment to Houghton, crosses the Arun where its valley is narrowest, descending to a level of 13 feet, and running eastward along the base of the Chalk escarpment through Storrington to Steyning. The second road proceeds northwards, crosses the ridge of the Downs at 420 feet, and descends very steeply to Bury, whence it runs north to Fittleworth; but where it crosses the line of Stane Street a branch runs north-eastward by the old Roman way through Pulborough, absolutely straight to Five Oaks, where it branches to the passes through the North Downs at Guildford and Dorking. Stane Street only remains visible in parts, but it is interesting to notice that the line by which it must have descended the escarpment of the Downs in its straight course to Pulborough is the easiest gradient possible, passing obliquely down the face of the southern side of the Bignor embayment. East of the Arun, the valley running north-eastward on the west of Highdown Hill, carries a high-road through the village of Angmering at an easy gradient.

It is important to notice that no high-road runs through the flat valley of the Arun from south to north; the villages along the river were thus isolated from one another more effectually than they would have been by hills. It is also noticeable that the chain of villages on the Upper Greensand terrace, at the foot of the Chalk escarpment, is not linked together by a continuous high-road. There is a winding road at the level of about 250 feet from Cocking through the Upper Greensand villages westward, and a rough road about the same level from Graffham eastward. The main east-to-west road runs north of the Rother through Pulborough, Petworth, and Midhurst, at levels between 100 and 200 feet for the most part; but there are numerous irregular cross-roads. This road crosses the Arun at Stopham, where the bridge was built in 1309 replacing the former Estover ferry. The name of Stopham house was formerly La Forde, or Ford Place, indicating the ancient importance of this point as a crossing-place. The main east-and-west road leads to Steyning, and to Winchester and Salisbury respectively.

The railways of the district exemplify the effect of superior engineering skill in overcoming the difficulties which kept the old road-makers away from the river-valleys. The South Coast railway from Brighton to

Southampton runs straight across the coastal plain from east to west past Arundel and Chichester, at a nearly uniform level of 30 feet above the sea, thus corresponding fairly with the high-road. The flatness of the plain is exemplified by the absolutely straight line of the railway. Branches run off southward to Littlehampton and Bognor. A steam tramway or light railway, 8 miles in length, runs from Chichester through the Hundred of Manhood to Selsey beach. It was opened in 1897. North of the Downs a single line runs from Pulborough up the easy gradient of the Rother valley to Midhurst, roughly parallel to the high-road, and another railway continues this line westward to Petersfield. From Midhurst the Pulborough line turns southward, jostling the high-road past Cocking and down the Lavant valley to Chichester. It passes under the highest part of the ridge by a tunnel half a mile long. The main line connecting the district with London is that which comes through the gap in the North Downs at Dorking and follows the line of Stane Street to Pulborough, thence striking straight down the centre of the flat gorge of the Arun to Ford Junction, where it joins the South Coast line. Between Pulborough and Ford it crosses the river or its windings no less than twelve times in 10 miles.

*Climate.*—There are no fully equipped meteorological stations reporting either to the Meteorological Office or to the Royal Meteorological Society, on the land portion of the two sheets (except Bognor, recently established), but at the Owers lightship daily observations of the temperature of the sea are made and reported to the Meteorological Office. Rainfall, however, is or has been observed at twenty-seven places for Mr. Symons's observing system, and the results are published in his 'British Rainfall' for each year. Those sending returns in 1898 were—

| Place. | Feet above sea-level. | Mean rainfall. Ins. | Place. | Feet above sea-level. | Mean rainfall. Ins. |
|---|---|---|---|---|---|
| Bognor ... ... ... ... ... | — | 27 | Patching ... ... ... ... ... | 130 | — |
| „ (Lidsey Lodge)... ... | — | 27 | Arundel (High Street) ... ... | 30 | 29 |
| Littlehampton (Surrey House) | 20 | 27 | West Stoke (Rectory) ... ... | 176 | 29 |
| Yapton ... ... ... ... ... | 24 | 26 | Eartham House ... ... ... | 240 | (32) |
| „ (Drove Farm)... ... | 14 | 27 | Forest Side Vicarage ... ... | 341 | — |
| Angmering ... ... ... ... | 44 | 27 | Watergate ... ... ... ... | 240 | — |
| Chichester (Sewage Works) ... | 10 | — | West Dean Park ... ... ... | 190 | 36 |
| „ (Westgate Meadow) | 40 | 28 | Chilgrove... ... ... ... ... | 284 | 33 |
| „ (Oaklands) ... ... | 80 | 28 | Petworth Park ... ... ... | 182 | 31 |
| Clapham (Rectory) ... ... | 150 | 29 | Repton (Lynch Farm) ... ... | 160 | 38 |
| Patching ... ... ... ... ... | 180 | 29 | Midhurst (St. Ann's) ... ... | 120 | 30 |

The distribution of rainfall was deduced from the mean rainfalls calculated by Mr. Symons in the manner thus described:

"Inasmuch as it is not infrequent to have several years in succession considerably above or below the average, it is not safe to trust to a short average; ten or fifteen years is the very shortest period, and twenty or

twenty-five years is desirable. But when dealing with a large area it is rarely possible to obtain records of twenty or twenty-five synchronous years; therefore one has to find the longest period for which several synchronous records exist, and to utilize observations for short periods by differentiation from the long ones, so that eventually one obtains strictly comparable results.

"In this case the eighteen years 1881–98 have been adopted, there being nine stations at which the records are perfect for the whole of those years. Take, for example, Littlehampton: the mean of the eighteen years is 27·28 inches, and as, on the map, the amounts are given to the nearest inch, the amount of twenty-seven is placed over Littlehampton. To take one other example, illustrating the use of a record covering only two years: at Beechwood House, Lavington, observations were made for only the years 1872 and 1873, and the mean of those two years was 45·08 inches; but those were very wet years, 14½ per cent. above the average, and therefore the 45·08 inches represents a true mean of 39·40 inches, and 39 inches is entered upon the map."

Taken altogether, the driest month of the year is April, and the wettest time occurs in October and November. The whole of the low coastal plain up to the level of 100 feet has a rainfall under 30 inches, the places with least rainfall being those lying nearest the sea. The southern slope of the Downs and the whole of the valley north of the Downs have an average rainfall of from 30 to 35 inches; but the crest of the Downs and the narrow belt immediately at the base of the escarpment (the Upper Greensand terrace) have a higher rainfall, closely approaching 40 inches.

The fact that the rainiest part of the region is the slope of the South Downs which is sheltered from the sea and from the prevailing south-westerly winds is curious, but may be explained by the cooling of the rain-bearing wind when raised to the highest point by passing over the Downs. This view is confirmed by the relatively low rainfall at Cocking, where the Downs are interrupted by a valley. The interesting district just north of the Arun gorge, between Amberley and Pulborough, which would throw much light on the causes of the distribution of the rainfall, is unfortunately without a rain-gauge, and the curves shown on the map (Fig. 8) are dotted at that point.

The total rainfall of the whole district averages about 32 inches, which corresponds to 3232 tons per acre; and the average distribution on the three natural regions may be estimated as—

| | Average inches. | Tons per acre. | Area, sq. miles. |
|---|---|---|---|
| Coastal plain ... ... ... ... | 27·5 | 2777 | 110 |
| Chalk Downs ... ... ... ... | 36 | 3636 | 80 |
| Rother and Arun valley ... ... | 34 | 3434 | 80 |

The average rainfall over the drainage area of the Arun, within these sheets, may be estimated at 34·5 inches, an annual contribution of

250,000,000 tons of water, if percolation and evaporation are not considered.

Although there are no meteorological observations taken in the district, the general climate is known by comparison of data in the neighbouring regions. From the monthly climate maps of the British Islands published by Dr. Buchan,* and from the Physical Atlas of Bartholomew, the following data are obtained: The mean temperature reduced to sea-level for the whole area lies between 50° and 51° Fahr., probably about 50°·7, and the annual range between the mean temperature of the warmest month and that of the coldest is 23°. The district lies in the sunniest belt of the British Islands, and has probably nearly 1600 hours of bright sunshine in the year, out of 4435 hours which the sun is above the horizon. The local climates must vary considerably, on account of differences of altitude and of exposure to sunlight and wind, taken together with the differences in rainfall. On the summit of the Downs at 700 feet or more, the temperature must be nearly 2°·5 lower at all times of year than at sea-level on account of altitude.

The south coast of England has the highest atmospheric pressure in the islands at all seasons. The prevailing winds are from some point between west and south-west, a fact shown clearly by the general slope of the trees on the coastal plain and on the crest of the Downs. The district lies in one of the minor storm tracks crossing the British Islands, and, especially in winter, is often traversed by the centres of cyclonic disturbances moving from south-west towards north-east.

The following are the mean monthly temperatures and pressures for the district reduced to sea-level:—

| | Jan. | Feb. | March. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Temp. ° F. | 39·5 | 41·7 | 43·0 | 48·5 | 53·8 | 60·0 | 62·5 | 62·8 | 58·5 | 51·0 | 45·7 | 41·3 |
| Barom. inch. | 29·99 | 30·01 | 29·93 | 29·95 | 29·99 | 30·02 | 29·99 | 29·97 | 29·99 | 29·92 | 29·95 | 29·98 |

The mean barometric pressure for the year is 29·975 inches.

(*To be continued.*)

## A JOURNEY FROM FORT JAMESON TO OLD CHITAMBO AND THE TANGANYIKA PLATEAU.†

By ROBERT CODRINGTON, Deputy Administrator, Northern Rhodesia.

I LEFT Fort Jameson, the headquarters of the British South Africa Company's Administration in North-Eastern Rhodesia, on April 25, 1899, and, accompanied by Mr. G. M. E. Leyer, travelled to the Loangwa river, which we crossed in lat. 13° 13′. The river at this point was only 350 yards wide and about 4 feet deep, but it was evident, from

* *Journal* Scottish Meteorological Society, Third Series, No. xiii. (not dated, 1898?).

† Map, p. 308.

the country on both sides, that, when in flood, it is at this point at least a mile wide. From Fort Jameson, which is 3857 feet above the level of the sea, we travelled through an uninhabited forest country, with plentiful water, to Msoro, where there is a trading-station of the North Charterland Exploration Company in charge of a half-caste Portuguese. There are a large number of Senga villages in the immediate neighbourhood, and a small trade is carried on in ivory and wax. Thence we travelled through a sparsely inhabited forest country to the Loangwa river, which at the point where we crossed it, at the junction of the Kapamba river, is 1609 feet above sea-level. We camped on the east bank in the village of Sunda. I had with me a folding boat made by Theo. Smith, Medley, Oxford. It weighed 200 lbs. complete, and required at least twenty porters, in reliefs, to keep up with the caravan for any length of time; but it was very easily stretched and folded up again, was capable of holding a large number of men or loads without any danger of capsizing, and proved most useful and serviceable throughout our journey. This boat we used for the first time in crossing the Loangwa.

Leaving the Loangwa on May 1, on the 3rd we climbed the Muchinga range, ascending 3460 feet to Hoste's deserted camp, which is 5072 feet above the sea. It was found impossible to induce any of the Wa-Bisa people in the villages through which we passed to carry any of our loads, the heaviest of which, with the exception of the boat, was under 35 lbs. The villagers invariably crowded round our camp, but as soon as the subject of work was mentioned, although good pay was offered and the people were almost without a rag of clothing, the assembly at once melted away, and in one case at least the entire population slept in the bush, regardless of cold or wild beasts, rather than have to listen to such horrible suggestions. Luckily we were provided with good gangs of Yaos from Blantyre, and Angoni from Fort Jameson, who, although only engaged to come with us as far as the Loangwa, agreed readily enough to stay with us as long as we required them.

From Hoste's camp we travelled through an uninhabited country, well wooded, well watered by numerous running streams, and of an unvarying altitude of about 5000 feet, to Serenje, about 12 miles to the east of which is a swampy piece of water presumably that marked on the map as Moir's lake.* No open water was observed, and as my companion had not yet recovered from a severe attack of malarial fever from which he had suffered on the Shire river, I purposely avoided all swamps, and took no steps to see for myself of what this particular one consisted. From Serenje we travelled through a level country with open plains alternating with light forest trees and occasional stony kopjes; water everywhere plentiful and good, but the population very

* See *ante*, p. 179.

small and scattered. On May 8 we crossed the Lehombo river, and again on the 9th. This river, which rises in the Irumi hills and flows into the Luapula, was, at the points where we crossed it, a deep swift stream. On the evening of May 9 we arrived at the present village of Chitambo. Chitambo, who is an intelligent man about thirty years of age, handed me, immediately on my arrival, a very interesting document, a copy of which is attached. It appears, from conversation with Chitambo, that his father died later in the same year as Livingstone, and was buried under the same tree, after which the village was abandoned.

On the morning of May 10, we travelled 13½ miles east-south-east from Chitambo's present village, and reached the site of old Chitambo, on the Lulimala stream. The trees have long since grown up all over the site of the old village, and, except for a small clearing and a low fence round it, there was nothing to distinguish the Livingstone tree, which was of a variety common to all the high country of British Central Africa. The inscription is, however, very well and deeply cut, the bark having been removed for the purpose, and shows that the boys who carved it took a great deal of pains to make the inscription as permanent as possible. The bark has grown over part of the "E" in Livingstone, and over part of the "3" in 1873. Borers were fast destroying the lettering, which is, however, still distinct with the exception of the last two lines, in which the first letters of the names of the followers have disappeared. The inscription now reads as follows:—

DR. LIVINGSTONE,
MAY 4, 1873,
. . . ZA MNIASERE,
. . . CHOPERE.

The tree itself was hollow, and the rot was eating through into the inscription, and would soon have destroyed it completely. The inscription was, therefore, not cut out a day too soon, as its existence was threatened by rot from one side and borers from the other, and any violent storm would have endangered the whole tree. There was also a risk of the inscription being carried away by private persons for the sake of speculation, one scheme of this sort, at least, being frustrated by my action.

Having taken steps to preserve the inscription from damage, I immediately cut down the tree, and sawed it off above and below the inscription. When this was done, its weight was so great that it was impossible for two men to lift it; and as there were several hundred miles of land transport to be accomplished before it could reach the ocean, I was obliged to take steps to bring it down to a reasonable weight. For three days my boys were engaged in carefully adzing out the inside of the section, until as much had been cut away as was consistent with the necessity of leaving a sound and durable piece of

timber. Carefully packed with a quantity of naphthaline to destroy the borers, the section was sewn in canvas and slung on a strong pole; but it was a very heavy and inconvenient load, weighing about 200 lbs., and required at least twenty-five carriers; had it not been for our folding boat, I doubt if we should have got it across the large rivers which flowed between us and the Tanganyika plateau.

I had brought with me from Fort Jameson one of the iron poles of the Trans-Continental Telegraph, and this I firmly planted in the very heart of the tree-stump, where it will serve to mark the exact spot for many years if necessary, until some more elaborate monument is erected. The lonely spot where Livingstone died twenty-six years ago appears to me to be appropriately marked by this symbol of European occupation, bringing with it the blessings of peace and the safety of life and property to the wretched people amongst whom his last days were spent. A large clearing was made and a strong fence built round the tree-stump on May 14. Everything being completed, we left old Chitambo and travelled 3½ miles to the Lulimala river, which we crossed in the folding boat, assisted by a few canoes from the large village on the river-bank. That night we reached the village of Kalonga, on the Lokulu river, which was 350 yards wide, a strong deep stream.

In all published maps of this country the swamps to the south-east of Lake Bangweolo are marked in a rather exaggerated manner. Our path passed through a succession of open plains fringed with thick and sometimes large forest trees, in which water was generally to be found, but never in any large quantity. The rivers which intersect the plains are wide and deep, and become choked and lost in grass and reeds, only narrow waterways for canoes remaining to connect them with the open water of Bangweolo, here called Bemba.

On May 16 we arrived on the bank of the Lotikila river, down which we paddled 1½ mile, until the river spread out into a lake about a mile wide and 5 miles long, surrounded by swamp and with no navigable outlet. Crossing this, we travelled 8 miles to the Munekase river, 75 yards wide, swift and deep, with high banks; thence 11 miles to the Lolingela river, 1000 yards wide; and thence 4½ miles to the Chambezi river, where I camped on the bank opposite the village of Kabinga, which is situated on an island. The present chief Kabinga remembered Livingstone, and says he was with him when he died.

On May 19 I went in my boat 7 miles down the Chambezi, to where a large river, which I took to be the Lolingela, runs in from the south and the Chambezi turns northwards. There was no sign of the Chambezi becoming choked with weeds and grass, but all native information pointed to the fact that there is no open water into the Chambezi, but only waterways for canoes. The Chambezi is a very large river. At Kabinga's it is 2 miles wide and 19 feet deep, and I found this

depth and width to prevail at least 7 miles lower down. The altitude of my camp at Kabinga's was 3791 feet.

Leaving Kabinga's on May 21, I travelled 26 miles up the Chambezi, and found the average width to be about a mile and a half, and the depth about 15 feet. There are a great many islands, and the banks are steep and well wooded. The population is considerable, but is scattered on the islands in the river and backwaters. There are practically no paths, canoes being the universal means of communication from village to village. The people who belong to the Ba-Bisa and Ba-Lala tribes have been driven to this mode of life by the raids of the Arabs and Awemba, but, having now life and property secured to them by the presence in the Awemba country of the British South Africa Company's Administration, they are likely to return to the mainland and the fertile banks and deltas of the rivers.

We arrived at Kasama, the Administration station in the Awemba country, on May 25. The Awemba, who inhabit the country which lies to the south of the Tanganyika plateau, have for many years past raided their neighbours, and, having allied themselves with the Arab slavers and coast men, were considered strongly opposed to the influence of any Administrative authority over them; and although they were not openly hostile to Europeans, they were somewhat jealous of their entry into their country. However, last November the paramount chief died, having been attended in his last days by Bishop Dupont of the White Fathers of the Algerian Mission, whose principal station in Rhodesia was on the border of the Awemba country. On Mwamba's death there was great commotion. The chief's compound was broken into and looted by his servants, the various claimants to the chieftainship called their followers together and made ready to assert their claims, whilst the bishop found himself surrounded by the majority of the people, who looked to him for protection from the rival claimants, and from the usual human sacrifices. Soon after the representative of the British South Africa Company's Administration, hearing of what was going on, arrived at Mwamba's village, and his presence was gladly welcomed by the people, who were still apprehensive regarding what would happen at the burial of Mwamba, and which of the rival claimants would obtain the chieftainship. A son of Mwamba's was without doubt the rightful heir, and this man Kalonganjofu was acceptable to the vast majority of the people, and received the tacit support of the Administration. It was from the first evident that with the death of Mwamba the integrity of the Awemba kingdom was at an end. The people were heartily sick of the cruelties and oppression of their chiefs, who, being unable any longer to raid far afield by reason of the European occupation taking place around them, were inclined to practise on their own people, for the most trivial offences, the barbarities formerly reserved for the punishment of dangerous criminals and the captured and

unsaleable enemies of the tribe. The glories of the Awemba tribe, the successful slave raid, the caravan to the coast, and the acquisition of guns, powder, and calico on a large scale, were almost things of the past; only the human sacrifices and mutilations remained, and those only whilst the great chief Mwamba was alive. It soon became evident that the only claimant to the chieftainship who was inclined to assert his rights in opposition to Kalonganjofu was Ponde. This man was not the rightful heir, and was feared and hated by the people on account of cruelty and oppression, and had only a following of young men.

In March, 1899, Ponde took the first and last step towards asserting himself, and advancing with his followers towards Mwamba's village, began to build a small fortification; but Mr. McKinnon, the British South Africa Company's representative, surrounded this place with a small body of the native police of his district, and after the exchange of a few shots it was abandoned by Ponde and his followers.

To the north-west of Mwamba's, near Abercorn, is the country of Mporokoso, an ally of the late Mwamba. On the death of Mwamba, the Arab slavers retreated to this chief, who, apparently fearing an attack on their account, began to build a strong fortification around his village; but this was also destroyed, and fifty-three slave women and fifty-eight children were released and returned to their homes in the Alungu country. After this the country became quiet, and both Ponde and Mporokoso have since made their peace with the Administration.

It is impossible to exaggerate the cruelties practised by the Awemba chiefs. In nearly every village are seen men and women with both eyes gouged out. The removal of one eye, one hand, etc., is hardly worthy of remark. Some, mere children, are seen whose ears, nose, lips, and hands have been amputated. When the removal of both eyes has been added to the above mutilations, the victims present a most pitiable sight.

Leaving Kasama on May 30, we travelled rapidly through the Awemba country to the Tanganyika plateau, and reached Fife on June 4, having travelled 615 miles since leaving Fort Jameson, and having with us the tree section safe and absolutely undamaged in transport; and a few days afterwards I had the gratification of handing it over for temporary safe keeping to the representatives of the London Missionary Society on the Tanganyika plateau, who were, of course, immensely pleased to see this relic of their most famous missionary.

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MR. CODRINGTON'S MAP.—Mr. Codrington writes: "It was done with a prismatic compass only, but the heights were taken with a boiling-point thermometer with great care, and are fairly correct, if there is no index error in the thermometer."

## COPY OF A DOCUMENT HANDED TO ME BY THE CHIEF CHITAMBO, AT OLD CHITAMBO, MAY 10, 1899.*

PROCÈS-VERBAL.

Ce aujourd'hui le 6 Juillet 18 quatre vingt douze nous avons réuni dans une grande palabre à Mwege-Kitambo les successeurs de feu Kitambo et environ 500 indigènes à l'éffet de leur remettre solennellement la garde d'une plaque de bronze † sur laquelle sont gravés les mots:

"DAVID LIVINGSTONE
DIED HERE,
ILALA, 1ST MAY, 1873."

Le village où est mort le célébre docteur anglais se trouve à environ 15 Ko. vers le S.E. et a été abandonné comp ètement par les héritiers de Kitambo à la mort de ce dernier.

Perdu au loin et au milieu des grandes herbes, ce n'est plus qu'avec hésitation que les indigènes désignent l'endroit où est enterré le cœur de Livingstone.

La plaque qui fut votée en scéance extraordinaire par la Société Royale de Géographie de Londres,‡ en mémoire du grand explorateur a donc été forcément vissée par nous sur un arbre au centre du village de Mwege-Kitambo.

Piana-Kitambo, âgé d'environ 17 ans, fils unique et successeur de Kitambo et ses cousins: Mwege-Kitambo, son tuteur et Kalonga, Chef du village de Masenga, prennent l'engagement formel de respecter et de faire respecter par les sujets et par leurs successeurs la plaque confiée à leur garde. Ils déclarent en outre que tous les Européens recevront dans tout le pays la meilleure hospitalité.

Leur engagement est consacré par l'octroi d'un présent qu'ils ont reçu et dont ils donnent décharge par le présent procès-verbal établi en double expédition.

Le Chef PIANA-KITAMBO.
(*mark*) +

Le Chef MWEGE-KITAMBO.
(*mark*) +

Le Chef KALONGA.
(*mark*) +

Le Commandant de l'expédition de Katanga,
(*signed*) BIA,
Capitaine de Cavalerie Belge.

Le Second de l'expédition du Katanga,
(*signed*) E. FRANÇQUI,
Lieut. d'infanterie Belge.

PRÉSENTS DIVERS.

Un fusil de chasse à 2 coups.
10 kilo. de poudre fine.
1000 capsules.
2 poires à poudre.
45 pièces de mouchoirs.
3 pièces de Guinée extra.
3 pièces d'Américaine.
3 pièces de bleu-stripe.
3 pièces de bleu-prints.
12 crasses de cotonette imprimés.
60 mouchoirs imprimés (animaux).
3 pièces de veloura.
3 pièces de soie.
3 pièces de mouchoirs en soie.
1 sabre avec fourreau.
1 grand couteau de chasse.
3 fez rouges.
3 chapeaux en velours soutaché.
3 parasols noirs des sonnettes, des perles, miroirs et des grelots.
Un paquet de clous de cuivre doré.

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* The original of this document is, by the kindness of Mr. Codrington, in possession of the Society.—ED. *G.J.*

† A replica of this plate has been presented to the Society by Mr. Alex. Morrison, of Edinburgh.—ED. *G.J.*

‡ The plate was not sent out by the Society, but by Mrs. Bruce, Livingstone's daughter. The Society sent a present to Chitambo in recognition of his services in connection with the removal of the body and personal property of Livingstone.—ED. *G.J.*

Village of Mwiwoiela, Chiefs Kawai and Tshitambo, July 13, 1894.

Upon my arrival to-day at the tree in the village of Tshitambo, where the memorial tablet to Dr. Livingstone was fixed by Captain Bia and Lieut. Franqui, I found the village had been deserted two years ago on account of the Wa-Wemba raiders, and the plate was stolen by a big slave-caravan, which left the country between the river Luapula and Lake Bangweolo about eighteen months ago in charge of two Swahili slave raiders and traders, Kasaki and Karuma.

These two men knew their followers had stolen the plate, and made a boast of having robbed the white man's grave.

Kasaki and Karuma had for many months raided the Iramba country, and when a large batch of slaves was collected, they put them in chains and slave forks and took them to the Zambezi to Nyungwe, somewhere at the junction of the Loangwa and Zambezi.

I have visited the exact spot where the heart of Dr. Livingstone is buried, and have a photo of the tree, with the inscription, carved by Jacob Wainwright.

The tree is situated about 5 miles S.S.W. of the village of Karonga on the river Lulimala.

(*Signed*) E. J. GLAVE,
Special Correspondent of the *New York Century Magazine*.

July 13, 1894.

## THE "SUDD" OF THE WHITE NILE.*

RECONNAISSANCES made by gunboats after the overthrow of the dervishes in 1898 revealed the fact that the *sudd*, or barrier of floating vegetation, by which the navigation of the White Nile is so much impeded, was at the time unusually dense and obstructive. Of the three principal channels by which the marshes south of Fashoda are traversed, the Bahr-el-Jebel, or White Nile proper, was found to be totally blocked within a short distance of its mouth. The Bahr-el-Zeraf, the smaller eastern branch of the river, was at first less obstructed, but here too navigation became increasingly difficult, as was the case also with the Bahr-el-Ghazal, which eventually became entirely blocked like the main river. In order to open up communication with the equatorial region, the Egyptian government was therefore obliged to take steps for the cutting of a passage through the barrier, which was said to extend with little intermission to within a few miles of Shambe, in about 7° 10′ N.

The expedition despatched for this purpose is under the command of Major Peake, who, according to recent telegrams from Cairo, has already made good progress with the work. The first barrier of *sudd* on the Bahr-el-Jebel was found in 8° 34′ N., and this involved the cutting of a passage near the right bank of the river for 25 miles, after which open water reappeared for a time. Three more blocks of *sudd* have been since cut through; and while engaged on the last of these, Major Peake met with various parties of Europeans proceeding down the Nile from the south. Of these one was a British reconnoitring party from Uganda, under the command of Captain Gage and Dr. Milne;

* The illustrations to this article are from photographs taken by Major E. A. Stanton.

the second a Belgian force under Major Henry and Lieut. Bertrand, who had made their way to that point from Kere, a post on the left bank of the Bahr-el-Jebel, a little above Rejaf; while the third consisted of thirty-seven French Senegalese tirailleurs, under Lieut. Monquedec, who had been stationed at Shambe. The last-named officer reported that the French posts at Meshra-er-Rek and Fort Desaix had been evacuated. The three expeditions all proceeded down the river to Omdurman, having been short of provisions when met by Major Peake.

CAMP ON WHITE NILE 25 MILES NORTH OF FASHODA.

They reported that 70 miles intervened between the latter's position and the termination of navigation from the south, beyond which there were only about 10 miles of *sudd*, with much open water. It is therefore hoped that through communication may be reopened before very long.

With regard to the history of the *sudd*, it appears that the river has long been subject to periodic blocking by floating vegetation, which seems to have formed an insuperable obstacle to the advance of the

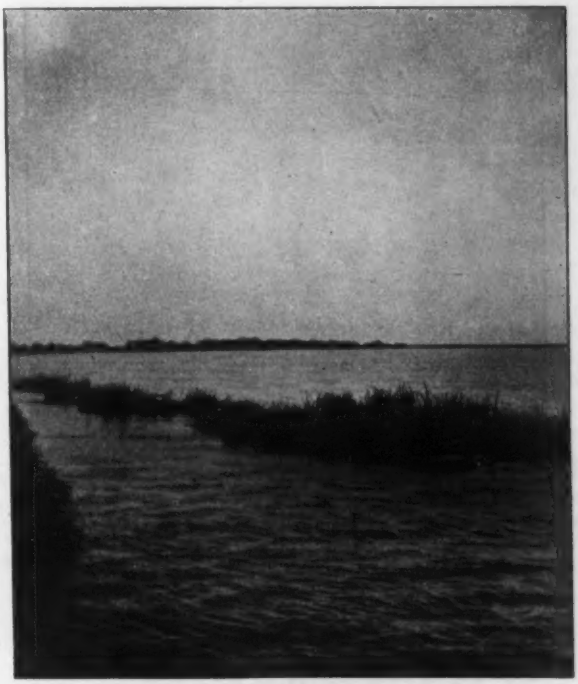
expedition sent up the river in the reign of Nero. The Egyptian expeditions of 1839–41 met with comparatively little hindrance, while Baker in 1862 also found an open channel of an average width of 100 to 120 yards. In 1863, when Mme. Tinné passed up the river, the barrier seems to have increased, and the Bahr-el-Jebel became entirely blocked by the time of Baker's second expedition in 1870–73, the only passage to Gondokoro being finally that by the Bahr-el-Zeraf, which itself was very much obstructed. In 1874 the barrier was at last cut through by

A STORM-TOSSED PIECE OF "SUDD" BEING BROKEN UP.

order of the authorities, and the Bahr-el-Jebel remained open for a time, the alternative channel becoming blocked in turn. The *Sudd* re-formed in 1878–81, and again in 1884, the free channel being only maintained by frequent use and the constant movement of the floating masses. Perhaps the best descriptions of the *sudd* are those of Schweinfurth and Junker, the former of whom gives "El sett" as the Arabic original of the name. The most important constituents in the barrier are grass, papyrus, and ambatch — the last named a soft-wooded tree of the

Leguminous order (botanically *Herminiera elaphroxylon*). The chief growth of this occurs at stated periods, in the intervals between which the obstruction becomes somewhat lighter.

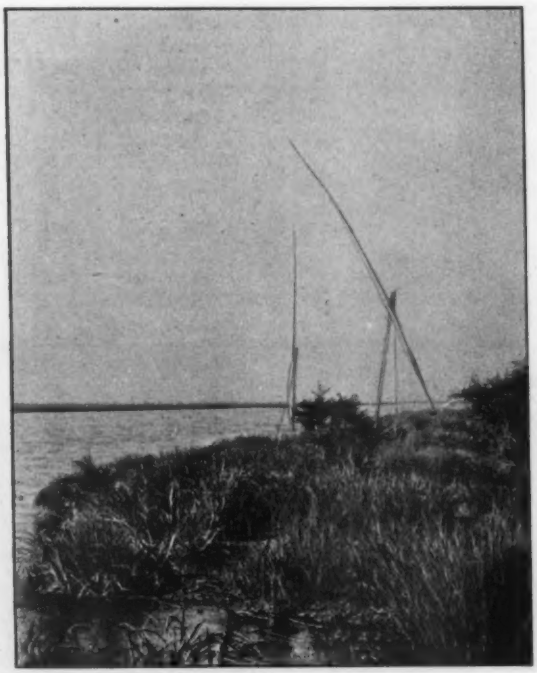
The great difficulty in maintaining an open channel in this part of the Nile basin arises from the fact that the whole country adjoining the river is a vast marsh, representing probably the bed of a former lake, in which the water spreads out and becomes to a large extent lost by evaporation. A report made early last year by Mr. W. Willcocks, with



WHITE NILE, NEAR SOBAT. DRIFTING "SUDD."

a copy of which we have been favoured, deals with the means for the permanent removal of the *sudd* and the reclamation of the region of swamps. Mr. Willcocks urges the importance for this purpose of the wholesale introduction of willows and poplars, especially the former, which experience on the Mississippi and elsewhere has shown to be the great reclaimer of swamps. Although found in some tropical countries, to which its spread has been facilitated by the flow of rivers from colder regions, the geographical phenomena of the Nile basin have prevented its

introduction there by natural causes. Mr. Willcocks says, "The Bahr-el-Jebel should be selected for the first operations, as it is not in the middle of the swamp, and because numerous streams flow into it from the west. As near to the first *sudd* as possible there should be begun immediately willow plantations on as extended a scale as money would permit. These would supply the stakes for staking across deep overflows, and the cuttings for planting in shallows. . . . Once the willow plantations were established, the alignment of the Bahr-el-Jebel should be fixed

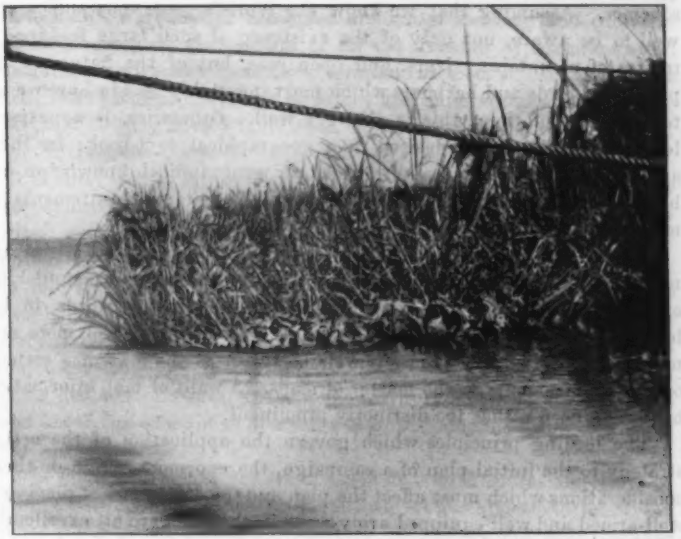


ON THE BANKS OF THE BAHR-EZ-ZERAF.

upon, and taking 300 metres as a suitable final width for the river, the staking, matting, and planting of cuttings should proceed southwards. Once the rows of willows and poplars took root, they would begin at once to form banks to the river, and the water, being confined to a single channel, would itself begin to clear its course of weeds."* The

* Baker (1862) found a current of from 1¼ to 2½ miles an hour in the open channel, above the mouth of the Bahr-el-Ghazal.

suggestions include the treatment of side rivers at their entrance, and the means for reclaiming the foreshore in the whole unhealthy region from Fashoda to Abba. Apart from the local advantages (including



COMPOSITION OF THE "SUDD" ON ZERAF RIVER.

the provision of plentiful fuel, and the elimination by the willows of unwholesome matter from the water), the proposed operations would, it is pointed out, have a valuable result in increasing enormously the summer discharge of the Nile in Egypt.

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## MILITARY GEOGRAPHY.*

By Colonel Sir T. H. HOLDICH, K.C.I.E., C.B., R.E.

SETTING the widest possible definition to the term "Military Geography," Mr. Maguire's book deals with the relations that exist between the geography of the World at large—the form and disposition of its seas and continents—to those strategical developments which have shaped the World's history in the past, and may shape it again in the future. Consequently, it is rather an epitome of historical examples to illustrate various phases of continental strategy than a geographical treatise. Not

* 'Outlines of Military Geography.' By T. Miller Maguire, LL.D. Cambridge University Press. 1899.

much is said of the influence of such geographical details as are comprehended under the term "topography" on the course of strategical combinations; and nothing whatever of the means whereby such geographical knowledge may be attained as is essential to strategical schemes. Assuming that we know the World's geography sufficiently well to be aware, not only of the existence of such large features as ranges of mountains, rivers, and open seas, but of the nature of the passes and fords and harbours which must inevitably decide how we are to make use of them, this is all very well. Otherwise, it appears to leave something to be desired in a geographical text-book; for there are certainly vast spaces of which our geographical knowledge can hardly be said to be equal to the most elementary requirements of military operations.

There is not a word too much in the opening chapters about the necessity for military geographical study, for certainly an astonishing apathy on the subject still exists in England. Sherman's words, in his letter to Ewing, quoted by Mr. Maguire, "Every day I feel more and more in need of an atlas," might well be taken as the text of a sermon on our requirements in the matter of maps. A want of map information has lately been rather too distinctly prominent.

The leading principles which govern the application of the art of strategy to the initial plan of a campaign, the enormous range of these considerations which must affect the plan and the difficulties of placing a well-armed and well-equipped army corps in the field, are all excellently well illustrated by historical examples; but the general deduction that all the leading principles of strategy are the same to-day as they ever were in past ages seems to require something more than historical example to justify it. For it would certainly appear to the non-instructed mind that the gradually widening disproportion between the advantages of defensive and offensive warfare, by closing certain lines of attack that have hitherto been considered open, and by altering the conditions under which armies should be manœuvred to the field of battle, would affect the principles of strategy considerably. In the chapter on the Command of the Sea, we find that our leading naval authorities are also of opinion that new naval appliances have in no way affected the strategy of naval warfare "any more than rifles and breech-loaders have affected strategy on land." But we venture to doubt whether the analogy between sea and land warfare is quite sound. An open flat sea presents no such variety of topographical conditions as may affect the application of modern artillery fire and render certain strategical movements unadvisable that were readily practicable formerly. Increase of range on the high seas would only appear to widen the circle of naval tactics.

Although the author well illustrates the importance of naval stations to England in the World's wide geography, the real moral of his teaching

may be found in the words, "No elaboration of defensive positions, no coast defences, however strong, give command of the sea, though they are both valuable and necessary. Command of the sea depends on a sea-going fleet as much as success in a land campaign depends on the field army." Well-chosen examples are given showing the complete mastery of strategy and control of all the avenues of communication throughout the world which have been maintained at certain periods of English history. His sea chapters are most interesting and instructive. If they have a fault, it is only that they are too short and too much condensed.

A chapter on the strategic relations of Europe with other countries naturally introduces a useful summary of the present relations between England and Russia in Asia. As there is only a periodic ebb and flow of public interest in Asiatic affairs, Mr. Maguire does well to point out, with reference to the great Siberian railway project, now so near its accomplishment, that "no territorial advance of Russia in the present century is comparable in importance to the step which has just been taken, after long and careful preparation." It places Russia within striking distance of Pekin, a fact which is duly emphasized; but little is said about the effect of such a railway in introducing a new European power to the Pacific.

It is those chapters in the book which deal with routes and lines of invasion, either hypothetical or historical, which appear to be of the greatest value to the student of military geography, not only because history is apt to repeat itself, but because it is in this connection that value of geographical knowledge can be most forcibly illustrated. Naturally the English student turns to India as the one vulnerable point in the British Empire, and there is very much about India in the pages of this book which he cannot do better than study most attentively. There are, perhaps, one or two minor suggestions made which might be considered as open to question. One of them occurs in page 236, where, with special reference to the political advantage of facing a northern enemy at Kandahar, the reason given is that it is in the highest degree unadvisable that India should see us fighting with Europeans. "Over that tremendous transaction," in the words of Sir R. Temple, "it is best that there should be a veil." Why? There was no veil drawn when the English fought for empire with the French, and both fought in line with native troops. Sedition and "unrest" would arise amongst certain sections of the civil population in India, whether we fought at Kandahar or on the Indus; amongst our military allies in India it would be a matter of the purest indifference where they fought. There are, doubtless, many strong reasons for defending India from outside our borders; but the hope of concealing anything from India is hardly one of them.

Very much useful information on the subject of railways is condensed

into a comparatively short space. The question of the proposed connection between Burma and China is entered into at some length, but to us it appears to be hardly so important as a question of strategical geography as that of the connection between Kandahar and Herat—on which subject the book is silent.

In one of the historical illustrations which Mr. Maguire introduces when treating of lines of approach, there appears to have arisen a slight geographical confusion. Alexander's route from Kandahar to Central Asia is given as passing by either the Bamian or Panjshir river, Aornus, Baktra (? Baktria), the passage of the Oxus at the modern Kylil (? Kilif), Maracanda (Samarkand), to the Jaxartes, and thence back again to Baktria. It is, of course, dangerous to assume any certainty in the compilation of a route from old world records, but the balance of probabilities seems largely in favour of that route crossing the Hindu Kush by the Kaoshán (the Hindu Kush pass *par excellence*), where it is known that Alexander was in the immediate neighbourhood of colonies of Greek origin, which might have helped him. Having crossed the Hindu Kush, it is difficult to account for Aornos, unless there exists any record of two distinct places of that name. The rock of Aornos, for the possession of which so gallant a fight was made, is undoubtedly Mahaban, overlooking the Indus from its right bank south of Buner. Old Greek names closely connected with the story of Aornos still survive there. After the return to Baktria we read that "he then conducted an expedition to Bokhara, making the passage of the Indian Caucasus." This is difficult to understand. He would only have to recross the Oxus to enter the Bokhara region from Baktria. The "Indian Caucasus" may possibly refer to the next movement, viz. his march from the Choaspes (Kunar) to India. This is, in fact, the one instructive point in the strategic plan of his operations towards India. He struck at India from Kabul; as did Babar; as did Nadir Shah; as did most of the invaders of India, who used the Kabul river route twenty times for the once that any more southern route was utilized. But the chief Kabul road to India was not then by the Khaibar; and it is a notable point in the strategy of these early conquerors that they reduced the hill tribes of Kunar, Bajaor, and Swat, who threatened the flank of their communications, before turning south into the flat plains of the Punjab. Surely the methods employed by these ancient warriors of safeguarding their line of communications by wiping off the face of the earth any people who might possibly interfere with them—a method which is hardly permissible in these days—points to some difference in the "leading principles" of strategy in early ages compared with those of the present?

There was one occasion when Western India was conquered by an enemy approaching from the west, which has unaccountably escaped the notice of most of our military historians. The Arabs invaded Sind

in the early years of the eighth century; occupied the Indus valley; stamped out the remnants of Greek influence, and imposed a dynasty (or succession of dynasties) on Multan which lasted for three centuries. They entered by a route which is not at all coincident with that followed by Alexander in his disastrous retreat to Persia. The latter is not well shown in the illustrative map at p. 288, for it fails to give point to one of Alexander's great strategical blunders, viz. that of attempting to make his army a base of supply for his fleet. Another blunder was his selection of a route the geography of which was unknown to him. As far as Makran he had had Greek pioneers to guide him, but here he made geographical assumptions, which, like all such assumptions, led to certain grief.

Mr. Maguire's book is a most useful work of reference both to the military student and the public at large. It is packed full of "wise saws and modern" (as well as ancient) "instances" from end to end of its 350 pages, and it possesses an excellent index. If we echo Sherman's cry for an atlas in further and fuller illustration of the geographical references, it is with the admission that it would be quite impossible to introduce anything like complete map illustration of so comprehensive a strategical survey within reasonable limits of space.

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## NARRATIVE OF A JOURNEY TO THE LAKES RAKAS-TAL AND MANASAROWAR, IN WESTERN TIBET, UNDERTAKEN IN SEPTEMBER, 1848.*

By Lieut.-General Sir RICHARD STRACHEY, R.E., G.C.S.I., F.R.S.

*September* 8. *Halt at Tisum.*—The thermometer, which at 6 a.m. stood at 30°·8, rose by nine o'clock to 54°, and at ten o'clock to 67°, after which the wind got up, and it became rather cloudy. It may be conceived that a change in the temperature of the air such as this, of 36° in four hours, was rather unpleasant. Inside the small black yak-hair tents used by the Tibetans, however, the change is still greater than this, and I have seen a difference of 42 degrees between 5 a.m. and 1.30, and that at an elevation of 18,400 feet.

As W. was still unwell, we halted to-day to give him a rest, and I went out in the afternoon to do something in the way of survey. I started off nearly south from *Tisum*, on the plain between the *Chaldu* and *Chirchun* rivers, and at a distance of about 4 miles came to a slight rising ground, from which I got a sight of the great snowy mass south of the *Manasarowar* lake, marked in our map as *Gurla*, the summits of which range from 21,800 to 25,000 feet. It was a good deal covered up in clouds, but still enough could be made out to see that it was a grand mountain. The Juharis called it *Mandhata*, after the name of a personage in the *Mahabarat*, but I don't think they could produce any authority for doing so. From

* Continued from p. 170. Map, p. 204.

the place where I stood, looking to the north, snowy peaks were seen in only two or three directions, and those were very distant, possibly none of them being within 150 miles. To the south-west was the *Balch* range, with very little snow upon it; everything beyond it was quite concealed by clouds. The plain, over which I looked for some 10 miles, appeared of a uniform pale brownish-yellow tint; the hills that rose from it inclined to shades of red, and the effect was anything but cheerful. The only sign of animal-life that I observed in this desert was a large cricket, *Gryllus*, with blue wings, that took short flights, making a peculiar quick, sharp chirrup as he went. Early in the morning, however, wolves had been heard, apparently hunting somewhere near our tents, and a young hare was run down in the course of the day by two of our men. During my absence, Winterbottom, in examining closely the herbage near our tent, found one or two novelties, and among them a curious little leguminous plant, with a remarkable four-cornered and winged prickly pod, which proves to be a new genus near *Eversmannia*. Mr. Bentham named it after me—*Stracheya Tibetica*, the real discoverer, W., having positively declined to allow his name to be perpetuated in such a way. Among the other new plants here met with may be mentioned the following: *Alyssum canescens*, * *Stellaria graminea*, * *Potentilla anserina*, *Saussurea glanduligera*, *Crepis glomerata*, *Parnassia ovata*, *Scopolia prœalta*, * *Salsola kali*; and a few grasses—*Stipa purpurea*, *orientalis*, and *sibirica*, *Festuca valesiaca*, *nitidula*, and *sibirica*, *Elymus sibiricus*.

A little excitement was produced at our camp early in the day by the report of the approach of a party of travellers. They turned out to be only some Juhari Bhotiyas returning home from *Kyunglung*, at which place our friend of *Topidhunga* had arrived, and had reported our intended visit to *Hundes*. But there had been no definite knowledge of our actual presence in Tibet. The chief civil authority of the place, the *Kharpun*, they told us, viewed the report with much philosophy; the entrance of foreigners into Tibet was notoriously prohibited, and what more was wanted to satisfy the Justice Shallow of *Kyunglung* that our threatened invasion was impossible? We took the opportunity of sending back letters to Kumaon by these Bhotiyas.

At night, 9 p.m., the thermometer was at 36°·5.

*September* 9. *Tisum to the Satlaj*, 15 *miles*.—The morning was cloudy; at 6 a.m. the thermometer was at 40°·5, and it rose nearly to 50° at 8 a.m. Our route lay down the *Jankum* river to the grazing or encamping ground called *Shib-chilam*, the ravine gradually getting deeper as we went on, till at that place, where the *Chirchun* river joins it, the bank is some 800 feet high, forming a steep cliff cut up into singular shapes, looking like ruins of towers and Gothic buildings. The deposits of gravel and sand, of which the plain was composed, might here be seen resting nearly horizontally on schist or shale, black and very rotten, that dipped at a highish angle to the north-west. These rocks are cretaceous, or possibly nummulitic. Between the two rivers, *Jankum* and *Chirchun*, on a tongue of land which hardly rose 100 feet above the water, were the remains of a village which had once existed here. Close by, also, the high-road from *Daba* to *Kyunglung* crosses the united streams by a bridge, said to have been built by a Juhari. On the opposite bank a cave was pointed out to us, where a man exercising the functions of a rural policeman was said to be posted by the *Kyunglung* authorities. These caves—for there are many of them in the alluvial banks—are commonly used as winter residences and storehouses by the nomadic Huniyas. A robbery was said to have taken place the year before of goods and chattels deposited in one of these caves, and to prevent the repetition of such outrages, the policeman had been posted here. During the whole of our journey we were continually hearing of

certain gangs of robbers, said to prowl over these parts of Tibet, and known by the Bhotiyas under the name of *Khampa*. This name, which appears at first to mean simply a man of the province of *Kham*, is, my brother, Captain Henry Strachey, informs us, an ignorant corruption of the word *Kyampo*, which signifies "nomad," and is applied by civilized Tibetans to the wilder races that exist along the northern part of the tableland abreast of the provinces of *Nari* and *Utsang*. Our Juharis were in constant terror of these marauders, who plunder tents and carry off cattle, when they dare, and we were told that some of them had just robbed a Bhotiya or Kumaon at *Darchin*. I received also long details of a raid made by the *Kyampo* two years back, on cattle belonging to the people of *Dungpu*, a village about 20 miles west from *Shib-chilam*. To avenge this, a considerable party of Juharis, who happened to be near at hand, combined with the villagers to hunt down the robbers, whom they appear to have treated as so many wolves, firing upon them without the least compunction. Five or six *Kyampo* were killed, some being shot in the capture by the Juharis, and the rest being summarily disposed of by the Huniyas, to whom such prisoners as were taken were made over by their allies. One or two of our party were present on this occasion, and evidently considered it rather good sport. The Juharis several times repeated to me that in *Hundes* the life of a man is looked upon as about of as much importance as that of a goat; their own civilization is sufficiently advanced to make the difference perceptible.

The constituted Tibetan authorities do not seem much superior to their subjects in matters of this sort, and I was told that one of their regular modes of execution was to smash with a sledge-hammer the thigh-bones of their prisoners, who were so left to die. In this manner, it is said, they murdered an officer of Golab Sing's *Dogra* army that invaded this part of *Nari*. When beleaguered in the Sikh fort at *Kardam*, he foolishly went out to treat with the besieging Tibetan force, when he was instantly seized and treated as I have said, though, with exceptional politeness, they ended by cutting off his head, a distinction not bestowed on ordinary culprits, who are left to perish as they may. No one will be surprised to hear that this brutal treachery and cruelty is accompanied by the basest cowardice.

In the valley down which we had come the vegetation was meagre, but I mention as deserving of notice, **Salsola Kali* and **Triglochin palustre*. This Triglochin I afterwards found again at *Hoti*, growing with **Triglochin maritimum* also at an elevation of about 15,000 feet. In addition to these plants, I should mention as being found in other parts of Tibet, and often associated with salt plants, Salsola, Eurotia, and the Triglochins already mentioned, a Crambe, *C. Cordifolia*, not greatly differing from *Crambe maritimum*, and *Glaux maritima*. With these are commonly seen many common northern forms of Potentilla, Ranunculus, etc., so that, strange as it may appear, we here often have at these great elevations, and in the middle of the continent of Asia, an assemblage of plants which may any day be found growing together on the sea-coasts of Northern Europe. It has been suggested with some reason that this curious feature of the Tibetan flora may be attributed to the immigration of the saline types of the Caspian. But considering that a coast-line certainly existed along the northern base of the Himalaya as late as the Cretaceous period, and the probability of the alluvial deposits of Tibet having been originally laid out beneath the ocean, it is not a very wild speculation to suppose that this marine flora may have been diffused along a former coast-line in the past ages of the Earth, and subsequently raised, by the general elevation of the surface, to its present position.

Early in the morning we had sent on two men as videttes to see that the high-road, which we here had to cross, was clear; on arrival at *Shib-chilam*, they reported that a beggar with a few goats constituted the only danger visible, so, he having been

voted contemptible, we proceeded to cross the *Chirchun* river. The water is muddy and dark-coloured, partly perhaps from its rising in glaciers, but partly also from the rotten black shale which here forms its bed. Having forded the stream, we ascended the high bank and again stood on the surface of the great plateau, which was here somewhat narrowly circumscribed by hills of bold outline. The road, or rather track, to *Kyunglung*, which place was now about 12 miles distant, could be seen for a mile or two in a north-easterly direction over the plain, and then, entering the hills, was lost to us. On the west we saw the track to *Dungpu* to a somewhat greater distance, winding between two low rounded lines of hills, the northern of which abuts on the *Chirchun* river near *Shib-chilam*.

TIBETAN BEGGARS.

Judging from their deep red colour, these ridges may probably be composed of igneous rocks, which are abundant in many parts of *Guge*. The bed of the *Satlaj* was not yet visible, but some low ranges due north of us were pointed out, some of which, we were told, lay on this side, and some on the other side of that river. The coast seeming to be clear, we kept on down the *Kyunglung* road, but before we had got far the alarm was given of a party of strangers coming towards us. An attempt to make out more exactly what they were with a telescope proved fruitless, in consequence of the mirage or haze, which utterly distorted all distant objects seen over the surface of the ground, for the sun was already beginning to show himself in earnest. After some consultation, during which we were quickly

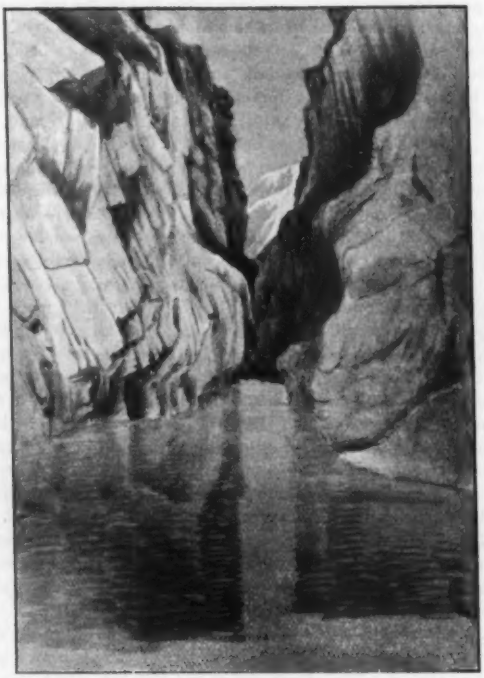
approaching the strangers, our people, influenced no doubt by their wishes, declared that they must be Bhotiyas, and not Tibetans, since some of them had on white clothes, which shone out brilliantly in the sun, whereas the habitual dress of the Tibetans is of a dark colour, either naturally or with intense dirt. So we went without hesitation, but to the horror of every one, when it was too late to get out of their way, they turned out to be a party of Huniyas. W. and I instantly tried to sneak off unobserved down a ravine near which we were moving, but the effort was evidently futile. The enemy, however, was plainly not dangerous in point of numbers, the party consisting only of two; so our people, having nearly ten to one in their favour, went on to meet them with great heroism. We soon saw that an amicable arrangement had been come to, and the combined forces, after a short conversation, came to the spot where we had posted ourselves. The Tibetans were two inhabitants of *Dungpu*, one dressed in white, one in black, with square-cut caps, Tartar physiognomy, very dark complexions, and long pigtails, and were well known to our people. They approached us making many polite bows, and, taking off their caps, presented the cloth of ceremony, as was becoming from inferiors to superiors. This is a form which is universal in Tibet, and extends into China, though I do not remember ever to have heard an explanation of the custom. The cloth we received was of cotton, badly woven, but of a fine texture, about the size of a small handkerchief, but so dirty as to show that it had frequently performed similar offices of civility before. The more wealthy classes employ silk instead of cotton cloths, the legend, "*Om mane padme hum*," being commonly woven in damask at each end. The sale of these cloths of ceremony, I was given to understand, constituted a Government monopoly in this part of Tibet. I made out that the strangers felt, or affected to feel, great alarm at having seen us, fearing the vengeance of their rulers, should it be discovered that they had become accessories to our felonious inroad into Tibet. They seemed, however, to have a preponderating respect for our friends the Juharis, with whom they had commercial dealings, and in whose favour the balances of trade were said now to be rather heavy. They were, in short, poor creatures who evidently were neither capable nor desirous of doing us any harm, or of opposing our advance; and after some talk they showed us how we might go straight down to the *Satlaj*, by a ravine near the head of which we then were, and so get out of the public road and at once avoid all risk of further notice. Assurances that they had only to keep their own secret, and a few rupees which we gave them, soothed them considerably, and we parted excellent friends. Before they left, however, we heard from them that nothing was known of us at *Kyunglung*, beyond the old reports that we were coming.

At 2.30 p.m. we stopped at the head of the ravine down which we were to go to the Satlaj, to put up the barometer, and the surface of the plain here proved to be 14,820 feet above the sea. The thermometer was 53°, but slight rain was falling, a storm accompanied by a strong wind having just swept longitudinally over the plain from west to east. The sun had been very hot in the morning, and the usual wind from the south hardly blew, which the Bhotiyas told us was a sign of rain. We here found growing on the dry surface of the plain, which was as barren as ever, *Chamærhodos sabulosa*, a Siberian plant; and an aster, *A. molliusculus*, with a rather handsome purple flower, was also common. A few more grasses were also seen, *Deyeuxia compacta*, *Stipa Eversii*, and *mongholica*, *Oryzopsis æquiglumis*, *Lasiogrostis mongholica*.

The ravine we followed took us gradually down among more vigorous vegetation, and some hares and partridges that we saw showed that the locality was better suited to support animal-life also. The partridge is, I believe, the same species (*Perdix Chukar*) common in the lower parts of the outer Himalaya, and in Kumaon

called *Chakor*, but why he should reappear here in a climate so very different is more than I can say. Our people deliberately set to work, and without difficulty ran down three of these birds, which I understand are common throughout Tibet. The hare, *Lepus Œmodius*, is also frequently seen all over the plain of *Guge*, being probably the most common of the creatures we observed. It is remarkable for its white tail, and its stupid habit of squatting close to its human enemies.

In passing along the ravine, I noticed that in the proximity of calcareous rocks that were seen to underlie the alluvial deposits of which the plain is composed, the boulders, gravels, and sands are frequently cemented together by carbonate of lime,



RIVER SATLAJ AT CAMP OF SEPTEMBER 9 (LOOKING EAST). ELEVATION, 13,350.

forming a thoroughly solid rock. This appeared to be precisely the same as the matrix which may often be noticed adhering to the mammalian fossil remains that are brought from these regions, and there can be little doubt that it is from some parts of the finer of these conglomerates that the fossils have been obtained. In the conglomerates, caves such as I have already mentioned are likewise common.

As we continued to descend, the horizontal alluvial beds were at length again seen to rest on shales and shaly limestones, which dipped at a high angle most commonly to the north-west, but much shattered and varying considerably in their precise dip and strike. The ravine, which had at first been straight, open, and with smooth sloping banks, now that it entered the solid rock, became much

narrower and more tortuous, and ended in an extremely narrow gorge with highish cliffs on either side, from which we had the satisfaction to emerge at about half-past four, on the edge of the *Satlaj*, close to which we encamped.

The spot on which we had thus almost stumbled was rather singular. The river flowed in a beautiful clear blue stream, in a deep and narrow bed, from the banks of which nothing was to be seen but the black shaly cliffs immediately overhead. The upper end of the gorge from which the river issued, seemed at first quite blocked up, but a closer examination showed a rent hardly exceeding 15 feet in breadth, through which the water came with a current that was hardly perceptible, proving the great depth of the channel, for the stream within 20 or 30 yards of its point of issue was already a sparkling rapid, some hundred yards wide, and by no means easy to ford. I thought I saw something like a trap dyke among

SATLAJ RIVER GORGE, ELEVATION 13,350 FEET (CAMP OF SEPTEMBER 9, LOOKING WEST).

the rocks in this chasm, but they were so steep that it was impossible to get at them. On examining the boulders and pebbles in the river, I found that the great majority were of the slates and calcareous rocks of the vicinity, but that a notable proportion were composed of porphyries, only one or two specimens of granite being seen. Similar porphyries have been brought to me from *Sansurga*, on the affluent of the Indus that passes *Gar*, and it is therefore probable that some at least of the intermediate mountains are composed of these rocks, a supposition which is rendered more probable by the fiery red colour of the surface which was remarked by Moorcroft, and which is confirmed by the accounts of the Bhotiyas, who are in the habit of going to the fair at *Gar*.

In the shales near the Satlaj I also found an Ammonite and Inoceramus, showing that these strata are either Jurassic or Cretaceous. We had here descended to 13,350 feet, the lowest point we reached during our expedition, and the vegetation was more cheerful, though still not much to boast of. The largest shrub was *Myricaria elegans*, a plant closely allied to the tamarisk, here growing to a height

of 5 or 6 feet, with stems often 3 or 4 inches in diameter. The dama (*Caragana pygmæa*) was more luxuriant than usual, rising to 3 feet or more. We here also found *Clematis graveolens*, greatly resembling *C. Flammula*; *Crepis glauca*, very like a form of the Altai mountains; two species of *Tanacetum*, *T. gracile* and *alternisoides*; and several species of *Artemisia*, or wormwood, a genus largely developed in Tibet, of which may be mentioned *A. sacrorum*, *salsoloides*, and *Roxburghiana*; also *Christolea crassifolia*, a cruciferous plant which might have been added to the list of saline types before given.

We found our encampment on the Satlaj, after the discomforts of the preceding days, quite luxurious. The *Myricaria*, which they told us was abundant at *Gar*, also gave us admirable firewood, an article in which we were speedily becoming connoisseurs, while we were greatly sheltered from the wind, and quite concealed from inquisitive Tibetans.

*September* 10. *From the Satlaj to Ligchephu, or Likstephu*, 16 *miles*.—Thermometer at 5.30 a.m., 36°·4. Having thus happily accomplished the first part of our projected expedition by reaching the Satlaj without interruption, we now turned off eastward towards the lakes.

As we started to-day, a stray yak was seen on the hillside just over our tents; it was forthwith taken possession of, according to the custom of these parts. The owner, if he is discovered, gets the animal again by paying half its value, and I afterwards heard that this happened in the present instance.

From the bank of the Satlaj we at once climbed to the level of the plain, but, among the low limestone hills by which we found ourselves surrounded, the presence of any alluvial deposit was a little doubtful. The vegetation became as scanty as before. From this position we had a fine view of the Himalayan peaks to the south-west. The morning was splendidly clear, and there was not a speck of cloud to be seen. The mountains at the head of the Milam glacier, and Kamet with its dependencies, came out very finely. Two other very distant peaks were also noted, almost directly down the course of the Satlaj, probably *Porgyul*, rather more than 100 miles off, opposite to which this river makes its great bend to the south. We continued for some time among low hills, and saw many barhal. As we were now again approaching the Kyunglung road, it was necessary to be more careful in our proceedings than on the previous day. The village of Kyunglung was not visible from our road, as it lay among the ravines near the Satlaj; but, understanding that it was one of the highest places in Tibet where crops of grain are produced, we sent a man round to pluck some barley from the fields. He returned to our camp in the evening with several ears nearly ripe. This grain, *Hordeum vulgare*, is the variety, *H. nudum*, the spikelets in two ranks, and grain *not* awned. He also brought some curious concretionary pebbles, evidently formed from fine shingle encrusted with concentric layers of carbonate of lime, derived from the water of a hot spring that issues from the south bank of the Satlaj opposite Kyunglung. These little pebbles are of all sizes, from that of a pea to a pin's head. They were quite separate one from another, though in a second hot spring at Tirthapuri, on the Satlaj, some miles higher up the river, a compact rock is formed by the agglomeration of similar pisiform spheres. In the Tirthapuri rock, specimens of which are often brought away as curiosities by the Bhotiyas who visit the place, the grains are very uniform in their dimensions, much more so than the Kyunglung pebbles. Both these springs are said to be very hot, that at Tirthapuri the hottest, so that it is disagreeable to put one's hand in it. The Kyunglung spring, from the accounts given of it—and it is noticed by Moorcroft at some length—is no doubt charged with sulphuretted hydrogen, the offensive smell of that gas affording an easy means of recognizing it. I should add that the water of

this spring, besides coating the pebbles as above explained, forms a large bed of tufaceous limestone, which is remarkable for its pure white colour and its friable texture.

Our route now lay over very uninteresting, undulating ground, dry and barren in the extreme; there was no road or even track, and the sun meanwhile was getting intensely hot. We halted about noon to rest the cattle at a place called *Gam*, where there was a small spring, and sought in vain for some shelter among the stunted bushes or rocks, none of which, however, rose high enough to afford even a little shade for our heads. The exposure during the heat of the day had by this time completed the removal of the skin from our faces. The extreme dryness of the air, and the cold winds, combine with the intense power of the sun to produce this effect, which is exhibited on the blackened faces of the Tibetans themselves, the poorer classes of whom are nearly as dark as the natives of the plains of Northern India. All about the halting-ground at *Gam* were many small pillars, built of dry stone, which we were told were erected by the Huniya shepherds to scare away the wolves and leopards from their flocks. The last-named animal is the ounce, *Felis uncia*. He is characterized by his long tail and the obscure markings of his skin, which is of a dull ash-grey colour. He is not uncommon in Tibet generally, and descends as low as 10,000 feet among the Himalayan valleys, and, it is said, often makes much havoc among the sheep. The wolf, called *shang* by the Tibetans, and the same species, I believe, as the wolf of Europe, offers curious example of the reappearance in the open regions of the Tibetan plateau of an animal which, although quite unknown on the wooded slopes of the Himalaya, is very common in the plains of North-Western India, and shows how the conditions of surface affect the development of animal-life, no less strongly than those of climate and temperature.

On leaving *Gam*, we gradually ascended. I set up the barometer on one of the highest parts of the ridge, 15,940 feet, which we crossed on our way from the *Satlaj* to *Ligchephu*, and while so employed was overtaken by a violent hailstorm accompanied by thunder and lightning. We saw this storm, like that of the previous day, driving up from the west, looking very black, and it passed on over us towards the lakes. The regular south wind had been wanting to-day also, and this had no doubt made the sun's power seem to us so excessive. During this storm the temperature of the air was not below 46°.

We now began to descend towards the foot of the hills which here separate the Satlaj from the great plain of *Guge*. Our route first lay over a flat piece of ground, which looked like a portion of the alluvial deposits of the plain that had been pushed up a few hundred feet more than the rest.

The halting-ground—for it is nothing more—called *Ligchephu*, soon became visible, marked only by a patch of green, under some limestone cliffs at the edge of the great barren plateau below us, while some small pools of water beyond it showed the position of the river by which we were to halt. We reached our camp at about 6 p.m.; it was pitched near the half-dried-up river-bed, on ground which, though now dry, looked as if it were at times swampy, or even altogether under water.

The evening was very fine, and the setting sun lighted up the mountains on the east and south-east most brilliantly, showing us very distinctly the towers at the place called *Lama-Chorten*, distant about 15 miles across the plain, close to which my brother passed on his visit to the lakes in 1846. *Lama-chorten* is the first halting-ground in the open plain of *Guge* on the way into Tibet from the Himalayan valley of *Darma* and *Byans*, by the passes of *Kach*, *Nyue*, and *Lankpya-lekh*. The buildings called chorten or choktan by the Tibetans are votive edifices, which are described by my brother as "little towers of dry stone, stuck

about with flags." These particular chortens, I was told, are erected by the married women of *Darma* as a votive offering for their husbands' safe return home from their travels in Tibet, and it is a common joke that the young unmarried women also set up their chortens in hopes of getting husbands in whom they may take a similar interest. It may here be mentioned that the people of *Darma* and *Byans* are so Tibetan that they have not adopted the Hindu customs of marriage, which, however, prevail to a great extent amongst their neighbours of *Juhar*. The girls of *Darma*, accordingly, instead of being betrothed and finally disposed of when mere children, are not married till they are grown up, when their own views are more or less consulted.

The sight of these chorten towers, which they were enabled to see distinctly by help of a telescope, greatly amused the less instructed of our Bhotiyas, and they talked of it for days afterwards.

This day had been particularly barren of botanical interest, not a single novelty being added to our list. The elevation of *Ligchephu* is 14,950 feet. At 9 p.m., thermometer in the air, 44°; in the tent, with the help of the fire, 58°·8. These figures will show the effect of the fire. In general we managed to keep the temperature inside about ten degrees above that of the external air, but only so long as the fire was burning, and in the morning there was generally but little difference of temperature between the inside and outside until the sun rose.

*September* 11. *Ligchephu to the Darma Yankti, 8 miles.*—At *Ligchephu*, at sunrise about 6 a.m., thermometer 28°·5; at 7 a.m., air, 33°; earth, a foot below the surface, 50°. The river at *Ligchephu* is the *Chu-naku*, or Black river. The part of it which will be seen from the map to bend suddenly back below this place, flowing nearly in an opposite direction to its previous course, is locally called *Biphu Kula*, a name meaning "contrary-flowing," and the *Biphu Kula*, therefore, is not a distinct stream, as was supposed by my brother. There is a great difference between the rivers in the eastern part of *Guge*, from the *Chu-naku* inclusive, and those in the west. The latter all flow in deep ravines, the depression of which below the surface is often exceedingly great. The beds of the eastern rivers, on the other hand, are all shallow, and not sunk more than 25 feet or so below the general level of the plain. This difference, which gives a totally different aspect of the two ends of the plateau, is readily explained by reference to the gradually increasing depth of the bed of the *Satlaj* as it flows westward, combined with the circumstance of the channels both of the minor streams and of the *Satlaj* itself being more in solid rock in the eastern parts of the plain, and more in unconsolidated alluvial matter in the west, where the thickness of those deposits is very much greater. The *Chu-naku* was at this season but a small stream, broken up into several different channels, all very shallow, and evidently constantly shifting their positions.

Leaving *Ligchephu* behind us, but still having on our left, at a distance of a mile or two, the hills from which we had descended the evening before, we forded the river and struck across the plain. Its surface was almost perfectly level, covered with small shingle, and having quite the appearance of a dried-up lake. This continued with no variation to the *Gunda Yankti*, a stream somewhat larger than the *Chu-naku*, with a bed 200 yards wide, its water also flowing in several different channels, and sunk about 25 feet below the plain. This section shows nothing but gravel, finer, however, than that seen in the larger ravines near *Tisum*. On the banks of this stream grows a small Hippophaë, *H. rhamnoides*, a species found on the east coast of England, which we had before met on the edge of the Milam glacier. It was here covered with small yellow fruit, which was exceedingly sour, though of a pleasant flavour, and it was eaten most voraciously by the Bhotiyas as they passed.

Beyond the *Gunda Yankti*, about 4 miles more of the plain brought us to the

*Darma Yankti*, a stream still larger than the former, but quite similar in character. We here again approached the hills more closely, and finally encamped at an altitude of 15,230 feet, under a low ridge round which the river flows.

Our march to-day was short, and after our journey was over I attempted to make observations with the theodolite to determine the height of *Gurla*, which mountain was becoming a more and more prominent object as we approached it. But a cold wind, which did not subside till late in the evening, was blowing with great force all the afternoon, and made it very difficult to observe angles with any degree of nicety. From the point where I had taken up my position, I looked over the plain towards *Tisum* for not less than 25 miles, but the view was rendered very indistinct by the mirage, which was so great that objects near the horizon lost their true forms even at short distances, and became quite confused, appearing to quiver and flicker as much as ever I saw them do in India.

On our road to-day we again observed a wolf, and some small antelopes (*Procapra picticauda*), but too far off to come within range of Bachu's gun; many *Kyang* were of course seen. The vegetation was still most meagre, *Oxytropis Stracheyana* being the only novelty. In the evening we held a council to consider our route, and determined to go on *viâ Gyanima*, intending thence to turn up to the north of *Rakas tal*; a plan, however, that we next day changed for the southern route, which we actually followed. At 9 p.m., thermometer in air, 41°·8.

*September* 12. *Darma Yankti to Gyanima*, 10 *miles*.—At 6 a.m., thermometer 28°; at 9 a.m., 53°.

Hugging a projecting point of the low hills on our left, or to the north, the summits of which barely reach a height of 15,400 feet, and leaving on our right two or three small detached hills that rise abruptly from the flat, we made directly for the so-called fort of *Gyanima*, or *Nima-khar*, the former name being a compound of the Tibetan words, *Gya*, "splendour," and *nima*, the "sun;" the latter of *Nima*, the "sun," and *khar*, "fort." The hill on which the fort stands soon became visible, though the lake at its foot did not appear till some time afterwards. The miserable slow pace of the cattle, the great power of the sun, and the extreme violence of the afternoon wind, made us heartily sick of this arid plain, which offered no novelties in any shape whatever to engage our attention during the hours we were crawling over it. At last we came sufficiently near to the lake to make us brighten up a little, for we knew that there would be Tibetans encamped with their cattle on the pastures along the water, and it was necessary to be careful where we went. The mirage, however, was so strong again to-day, that it was difficult to make out objects with a telescope any better than with the naked eye, and a solitary wild donkey standing in our way kept us on the *qui vive* for some time. When at length he was clearly distinguished, we went on with additional confidence, for his presence showed that men were still far enough away. By degrees, as we approached the water, the haziness became less, and we saw distinctly several encampments a mile or two off. There were clusters of small black tents, with cattle grazing near, and human figures were seen moving about them. We were so little elevated above the sheet of water that its form could not be made out, but we saw that it extended to the north-west many miles in length, and that its borders were fringed with vegetation, the dark colour of which contrasted with the pale bare surface of the plain beyond. On the opposite side of the lake rose fine-looking hills, bold and utterly barren; they are the highest between the Indian watershed and the *Satlaj*, and yet we could only discern a single small patch of snow on one of the highest summits, which I afterwards determined to be 18,400 feet above the sea. Their rich reddish-brown tints made it probable that they were composed of some of the igneous rocks on which we were just entering.

The plain over which we had been travelling for the last two days, its perfectly level or gently sloping surface covered with shingle, the mountain slopes which bounded it, and the detached hills that rose from it, presenting cliffs that sloop up abruptly like rocky coasts and islands, forcibly suggested that here was the dried-up bed of some great lake or inland sea, to which the effects of the mirage frequently gave a wonderful reality.

The hill of Gyanima is an isolated mass of eruptive rock, chiefly hypersthene or bronzite. The surface is much fissured, and the rock breaks up very readily into small fragments. Coatings of serpentine and siliceous matters are also common on the faces of the joints, and it weathers to a reddish-brown colour. The regular road lies through a depression in the middle of this hill, which our cavalcade therefore avoided, moving off round the south-east extremity, under the further angle of which our camp was formed.

TIBETAN TENT.

I myself went straight down to the lake, passing tolerably close to a Huniya tent, the people near which, however, took no notice of us. The ground at the north-west angle of the hill over which I passed is customarily occupied earlier in the season by the Jubari Bhotiyas, who encamp here, as I was told, this being one of the regular marts for the traffic between the Tibetans and the people of the upper Himalayan valleys, the former bartering salt and borax for grain or Indian or European commodities brought up by the Juharis. The soil was covered with green turf intersected by numerous small streams, and in some parts was even a little boggy. *Ranunculus aquatilis* and *Hippuris vulgaris*, or horsetail, both common English plants, were growing in all the pools; *Ranunculus cymbalariæ*, a small creeping species with tridentate leaves, is common in all the valleys of Hundes, and widely diffused over Northern Asia and America; two *Gentians*, and a very small purple *Primula*, *P. Tibetica*, not exceeding an inch in height, were abundant amongst the herbage. In the streams, which were usually only two or three feet in depth, were many small fish. One of these we managed to catch, and our Bhotiyas said that when they are encamped here they get plenty of larger size. Men stand in the shallower parts of the streams with sticks, ready to strike at the fish, which are driven down from some distance by another party, who come along in the watercourses. I saw no large fish, however, and it was suggested that they had retired into the lake, as it was now getting cold again; and it is possible, for these small rivulets must cool down much before the general mass of water in the lake.

Not being certain whether or not there might be any one living in the remains of the old fort on the top of the hill, we did not venture to intrude upon it, but we were given to understand that it consisted only of the ruins of the walls. I did not gather that any historical or mythical interest was attached to the ruins. From the foot of the hill, however, we got a good view of the lake, which is a sheet of water 10 or 12 miles long, but nowhere probably much more than a mile in breadth. From its lower end, I was told, a stream flows off and joins the *Darma Yankti*, which soon afterwards unites with the *Gunda Yankti*, and the combined river then takes the name of *Chu-kar*. The upper end of the lake where we stood terminates in pools of water and swamps, a very small stream only flowing in from this quarter. The ground along the edges of the water was generally low, and many Huniya encampments were dotted along the banks, with immense flocks of sheep, herds of yak, and a few horses, all of which we saw very distinctly with our telescopes. Innumerable waterfowl covered the spits of mud that ran out into the lake at this southern end, and large numbers of birds were also collected about the pools and swamps. Of these may be enumerated a fine large grey bustard with black neck and tail, grey geese, ducks, teal, snipe, terns, sandpipers, curlew, a fishing-hawk, and small heron. The bustard refused to be shot, and walked off triumphantly as the sportsman approached; and a goose, anxious, I suppose, to support the reputation his family has earned, was the only victim of Bachu's arts. Sticking to one of the feet of the goose was a small leech.

The ground all about our camp was covered with the burrows of a small rat-like animal with a very short tail (*Cricetus songaricus*), a specimen of which I afterwards managed to catch.

Along the foot of the hill issued many copious springs, the temperature of which was 36½°. The open running water in the afternoon, about five o'clock, was 43°, and the temperature of the earth 9 inches below the surface, 47°. The surface of the lake was calculated to be 14,880 feet above the sea.

On returning to the tents after our short stroll to the point overlooking the lake, we found our company drinking tea in the Tibetan style. This is quite a different operation from the Chinese or European infusion system. The tea used is of the description known as brick-tea, which is tightly compressed into brick-like blocks. It is boiled with carbonate of soda and butter, flavoured with salt, and thickened with barley-meal, thus forming a sort of soup. To my taste this particular brew was simply nauseous. The compound, when concocted with proper materials and on scientific principles, is declared by competent authority to be good. I suppose, therefore, that as there certainly are differences in English teapots, so there are also in Tibetan kettles. Tea-drinking is a constant occupation for a Tibetan. In every tent and in every house the tea-kettle is always on the fire. The laws of hospitality bind all to present tea to their guests, and every Tibetan carries with him a wooden bowl of Himalayan maple by way of teacup. The universality of tea-drinking in Tibet is such that it would appear to offer a good market for the produce of the Himalayan tea plantations. At 8 p.m., thermometer 36°.

*September* 13. *Nima-khar to Jungbwa Tol*, 20 *miles*.—At 6 a.m., thermometer 23°·5. This temperature may perhaps have been affected by radiation, but the cold had been rapidly increasing during the last few days, when the rainy weather on the Himalaya seems to have ended. At 8 a.m., thermometer 42°. Leaving *Nima-khar*, we crossed the plain at the head of the lake, here something under a mile in breadth, and came upon low rounded trap-hills, similar in their constituents to the hill of *Nima-khar* before described. A few isolated points also projected from the middle of the plain.

We had now reached the extreme eastern end of the great plateau of Guge, and entered a hilly country characterized by numerous valleys with perfectly flat alluvial bottoms by which it is intersected. Most of these were quite dry, small streams existing only in a few of them. This circumstance, added to the almost perfect horizontality of their transverse section, their general agreement in elevation with that of the great plateau, the abrupt rise of the rocky hills on either side of them, and their general uniformity of breadth for considerable distances, seems quite to preclude the possibility of existing agencies having caused them. They must, without doubt, have been produced by the action of currents in extensive bodies of water that have formerly been spread over large portions of the plateau, but I cannot say that there seems any decisive evidence to show how or when this action took place. I have elsewhere given my reasons for believing that the alluvial deposits of *Guge* were first laid out by the ocean. The valleys to which I am now alluding may either have assumed their characteristic forms before the elevation of the great plateau above the sea-level, or they may have been formed after some partial elevation, when lakes much larger than those now remaining still existed, the waters of which have been since drained off.

Crossing over a considerable spur from the high hills north-east of *Gya-nima*, we again descended into a broad level valley, which, by taking a more circuitous route, we might have followed the whole way from the lake. Up it we had, for the first time, a complete view of the grand dome-like peak of *Kailas*, distant from us about 35 miles. This valley, which is about half a mile wide, is called *Tara*. It had once been green, no doubt, but was now quite burnt up and yellow, and it is probably only in the spring, when the snow is melting, that the vegetation has any activity. A little further on we came to a stream in which we saw many small fish. We managed to catch a good many, but through the stupidity of one of my servants, they were unfortunately all thrown away soon after my return to Kumaon. They were of three species—the largest about 8 inches long, with scales, no doubt carp (*Cyprida*); the others 4 or 5 inches long, with cirrhi and without scales (*Siluridæ*). The stream seemed nowhere to be more than three feet, and was generally only one foot deep, and during the winter it must certainly have been frozen into a solid mass, with all it contained. The question naturally arises, Do the fish live through the winter frozen up with the water? The only way of getting over the difficulty, if this be a difficulty to a fish, is by supposing that the stock is renewed every year from the lake at Gyanima, at a season when there is sufficient water to supply a continuous stream the whole way along. When we were there no such communication existed, and the bed of the stream was in many places dry, but while the winter's snow is melting off, the quantity of water may be larger. This valley we followed up for many miles. It was bounded on either side by trap hills covered with loose stones, and utterly bare of all vegetation. The diminutive stream at its bottom had green margins, which now afforded but scanty pasture, for the ground had been closely cropped by the flocks of the Huniyas. The valley was now abandoned, but we everywhere saw signs of their old encampments. After a long and tedious march, in which the previous labours of the sheep and goats rendered our herborization null and void, we passed the watershed, beyond which the drainage begins to fall into *Rakas-tal*. The division of the waters is hardly marked, the two valleys running into one another with hardly any interruption. The summit level is probably not more than 200 feet above the level of *Rakas-tal*, or 15,200 feet above the sea. We here, for a short distance, went over the same ground that was passed by my brother in 1846. He, however, ultimately turned off round the north end of *Rakas-tal*, while we made for its southern border.

It was now nearly sunset, and we were rapidly approaching *Jungbwa-tol*, where

camps of Tibetan shepherds were certain to be found, and, what was worse, Tibetans who knew our Milam people. One of them was known to have left Milam only a few days before us, and if our party was discovered, it would have been at once detected that we had no legitimate business here. Nobody knew the precise localities, so it was clearly desirable to come to a halt before dark, as otherwise our difficulties might have been much increased. Scouts were consequently sent on in advance, and we anxiously looked for water, without which we could not halt, but water there was none. Thus forced to advance, we very soon received a report that we were close to some Tibetan encampments, and, turning a corner, we looked through a side ravine into a most inviting green valley with plenty of water; but it was not for us, and we passed rapidly on. Hoping to get a better idea of the localities, or to be able to discover some place where we might get water, I started up the hill on our left, from the top of which I looked down into the valley we had just seen. It was wide and open like that of Tara, with a stream or succession of pools of water tolerably near; but it was fully occupied by Tibetans, and we could do nothing but go on. In coming down the hill, I descried some large flocks of sheep in the valley directly ahead of us, so it was evident that we must run the gauntlet of our supposed enemies. We went on, therefore, as boldly as might be, the Bhotiyas in a desperate fright, and, on turning a projecting point, we found that the valley along which we had come opened into another larger one, in which we saw, within a quarter of a mile of us, two Tibetan encampments on our right and one on our left. It was now dusk, and as turning back was out of the question, we went to what appeared to be a stream in the centre of the valley, but to our utter disgust it was quite dry. However, a halt had now become quite unavoidable, and, moreover, it was plain, as the Huniya tents were so near us, that water must exist close by. So here we encamped.

Boru, the Padhan of *Tola*, who by this time had shown himself to have far the best head of the party, was immediately sent off to reconnoitre. He fell in with an old woman who was driving home a flock of sheep, and soon came back and reported that the *dong*, *i.e.* pastoral encampments, belonged to shepherds from *Hortol*, a place the other side of *Manasarowar*, who were pretty certain not to know any of our people. Water was also pointed out in the bed of the stream close by, and matters appeared to begin to mend. By this time the night had set in, and the moon was shining brightly. Our tents were just pitched, when from one of the camps near issued a most alarming-looking horseman, who rode straight down towards us, the long dark shadows adding to the terrors of his appearance, but the spectre dissolved into nothing more than the reality of a boy taking home a stray pony.

As it was now getting dark, and every one was tired, Boru once more started with one other Bhotiya for the nearest Tibetan tent, to see how far our more pressing wants could be supplied without further exertion on the part of our men. He very soon returned with a large bundle of firewood, and a great copper pot of water for immediate consumption. Boru had most successfully imposed upon the Huniya, but it was, nevertheless, at once noticed, from his dialect, that he came from Juhar—a matter, however, which was of course instantly explained away. The other Bhotiya affected not to understand Tibetan, so that he could not have awkward questions put to him. The Tibetan, though most polite in most particulars, was firm on one point—he flatly refused to give us milk, although the money was produced. It was unlucky, he said, to sell this at night, but we might have as much as we pleased in the morning. On the whole, we seemed to have got well out of our scrape, though our scanty supply of wood sent us to bed miserably cold, and with a rather less luxurious supper than usual.

*September* 14. *Jungbwa-tol to Camp south of Rakas-tal*, 8 *miles.*—It had been

settled beforehand that W. and I were to start by daylight, leaving the rest of the party to follow a little afterwards, so that we might escape observation as much as possible. We had a cold walk for about a mile over low hills, still composed entirely of eruptive rock, and of the same rounded forms that we had met on the previous day. On getting to the top of a ridge which we reached before sunrise, we saw in the valley below us, and the direction it was supposed we ought to go, the smoke of another Huniya encampment. As the single Bhotiya we had taken with us knew no more of the country than we did ourselves, we thought it best to stop here till the main body came up, so that we might then go on together, for in such rugged ground it might have been difficult to find our party again if we had once diverged from the proper track. We sat on the top of the hill for a long time shivering in the cold, with the thermometer some four or five degrees below the freezing-point. The only thing that could be seen was the smoke curling up from the valley below in the faint grey light of the morning, and the silence was broken only by the barking of the dogs about the tents. At length the sun rose, and we found that we were overlooking a broad flat valley, the continuation of that in which we had encamped, which manifestly led down to *Rakas-tal*. The shepherds soon were stirring, and not long after we saw their flocks driven off to graze. The appearance of the sheep on these bare hills, which present no objects of known magnitude by which the eye can rapidly form a correct estimate of their distance, was most deceptive; even till the last, when among these barren wilds, I was quite unable to distinguish offhand, even at moderate distances, between sheep and white stones, or between dark objects, such as bushes and men. In the Himalaya, in looking across a deep precipitous valley where there is no gradation of distance, owing to the centre of the picture being unoccupied, I have often found it difficult in like manner to judge of magnitudes, and have consequently mistaken goats for cows, and *vice versâ*.

Our people now soon came up, having left their ground without the least suspicion being raised. We all started again together, straight across the hills, nearly due west, over such ground as no beast of burden but a jhobu could have passed; at one time climbing rocks, at another floundering down infamously steep slopes covered with loose fragments of stone, to face which on the backs of our cows required some nerve even after the apprenticeship we had gone through in the previous part of our journey. This rough riding rapidly carried us clear of the pastoral Tibetans, and it was not very long before we were rewarded by a first sight of the sacred lakes. On turning a corner on one of the ridges we had to cross, we suddenly caught a glimpse of the beautiful blue water of *Rakas-tal* sparkling within a few miles of us. Through a depression in its further shore, a small portion of the lake of *Manasarowar* could also be distinctly traced as a small dark line, beyond which rose a distant range of purple mountains.

We stopped to breakfast in a ravine, near which many of the Sikh or Dogra invaders of this country were said to have perished in the winter of 1841–1842, chiefly from the cold. Their bones and those of their cattle, with remains of clothing, etc., were pointed out to us as we went along. What we saw were the remains of some of the less fortunate parties of fugitive Sikhs. The Sikh expedition has made so strong an impression on the Bhotiyas and the people of these regions, that the year in which it took place is invariably referred to as the *Singh Sal*, *i.e.* the Singh or Sikh year, when allusion has to be made to events that happened about that time.

Among these ravines the vegetation was a little more vigorous, and had been less disturbed by sheep or goats, and we added a few plants to our collections, of which I may name the small willow, *Salix sclerophylla*, not uncommon; *Rheum*

*Moorcroftianum*, a species of rhubarb very common in Tibet; a handsome gentian, *G. nubigina*; and *Lagotis glauca*, a plant of Northern and Arctic Asia; *Arenaria Stracheyi*, and *Pleurospermum Hookeri*. The rugged nature of the hills that here flank the southern shore of *Rakas-tal*, or, as it is called by the Tibetans, *Tso-Lanak*, *Tso* signifying "lake" in their language, obliged us to keep at some distance from the water's edge, and to ascend to a considerable height above its level. In crossing one of the ridges on our route, a magnificent view of the lake at length opened out to us, though it must be confessed that the frightful south wind, that had already begun to blow with extreme violence, rendered real enjoyment very difficult. The lake of the *Rakshasas*, or "Demons," is of a somewhat irregular form, about 20 miles in extreme length from north to south, and about 12 miles in extreme breadth across its southern end; its northern half, however, nowhere exceeds 6 miles in breadth. As I cannot improve on my brother's description of this lake,

Peak of Kailas, 22,000 feet.

LAKE OF RAKAS-TAL OR TSO-LANAK, 15,000 FEET.

I extract it entire: "The snowy mass of *Momanangli*, a name now replaced in our map by the more euphonious one of *Gurla*—and the authorities on which this last name rests must not be examined too curiously—was again conspicuous to the south-east, and from the base of the mountain a lofty range of hills, partially tipped with snow, stretched north-westward, separating the lake from the head-valley of the Karnali, and forming its south-western banks nearly parallel to the course of the river." Across the spurs on the north face of this range, I may observe, we were advancing, and though a little snowy when seen by my brother, it was at the time of our visit quite bare, excepting in very few spots in the most retired ravines; the snow that he saw having no doubt fallen during the bad weather that immediately preceded his visit to this part of Tibet. The highest points of this ridge rise somewhat more than 2000 feet above the lake, or say 17,500 feet above the sea. "These hills," continues my brother, "rose abruptly out of the water in bold rocky banks, with many deep inlets, promontories, and one or two islands of the same character. This part of the lake is altogether so irregular in outline, that it could hardly be defined without detail survey and close inspection

of every point. The eastern shore was bounded by shelving ground and low hills, the south end being a good deal recessed eastward into a deep bay, the middle part advancing further westward in a rocky bank of moderate height, and the north end sweeping round to the westward as far as could be seen, with a margin of green grassy plain, from the bank of which the *Kangri* mountains rose in dark steep slopes. The main peak of *Kailas*, now beautifully developed to its very base, was seen on the extreme left of the range (so far as visible to us), and over the low hills in the middle of the eastern shore, a streak of bright blue showed a distant glimpse of *Manasarowar*. The western shore of the lake was undulating ground or low hills, over which we had been travelling this morning, at the foot of steep and lofty hills here and there streaked with snow." The highest of these hills, I may again notice, our subsequent operations have shown to rise to 18,400 feet above the sea, or above 3400 feet above the lake. "The water of the lake was of the clearest, brightest blue, reflecting with double intensity the colour of the sky above, and the northern horn of the water, overshadowed by the wall of mountain rising above it, was darkened to a deeper hue, partaking of the fine purple colour that distinguishes the rocks of *Kangri*. Fresh breezes broke the surface of the water into waves that rolled upon the shore. The surrounding hillsides, though very bare of vegetation, were tinted with many shades of red, brown, or yellow, happily varied with the margins of verdant grass in other parts of the shore, and bright sunshine spread a warm glow over the whole landscape, entirely divesting it of the cold barren aspect that might be supposed inseparable from these intemperate regions."

We halted for the night at an elevation of 15,440 feet, in one of the ravines at about a mile and a half from the edge of the lake, any view of which, however, was prevented by the precipitous character of the intervening ground. The distance we had travelled was perhaps not much more than 6 miles in a direct line, but the extremely rugged nature of the country caused us to make long *détours*, which greatly increased the length of the journey. Thus far the rocks were entirely of the same eruptive nature as before, chiefly hypersthenic, and the surface was everywhere covered with loose angular fragments, generally of a dull red colour, and utterly barren excepting in the ravines.

A further consultation was here held as to our route. The Bhotiyas protested most vehemently against passing along the northern edge of *Rakas-tal*, under the Tibetan settlements of *Darchin* or *Tarzum*, excepting during the night—an arrangement that we thought would be highly objectionable, for we found the day marches quite sufficiently painful, and very little could have been seen at night to compensate for the discomforts we must have put up with. We determined, therefore, to continue our course round the south end of *Rakas-tal*, and to go up between the two lakes as far as *Ju*, at the north-west corner of *Manasarowar*, where the point of efflux of that lake was supposed to be. This we were anxious to see, for Moorcroft had denied the existence of any opening there, though my brother had crossed a large stream some miles to the west of *Ju*, which he was informed came from *Manasarowar*. We proposed to return from *Ju* to this place, and thence, crossing the ridge to the south of us, to proceed by the *Karnali* valley back towards *Tazang*; and we therefore here left behind us a depôt, only taking on with us eight men and ten jhobus, with supplies for five or six days. At 6 p.m., thermometer 28°.

*September* 15. *Along the South Shore of Rakas-tal*, 10 *miles*.—At 6.15 a.m., thermometer 28°·2; at 8 a.m., thermometer 29°·5. Close to our camp we came upon a direct track, said to be one of those leading from *Jungbwa-tol* to the valley of *Purang*. The road—a mere track for men and cattle, any approach to wheeled

carriages being utterly unknown in these regions—comes round this way, apparently out of the direct line, to avoid the high rugged hills along the flank of which we had been travelling yesterday, for the ridge becomes much rounder and less elevated at its eastern end. We followed this track for about a mile, and then, hoping to be able to keep along the edge of the lake, we turned down a ravine to the left, which we followed till we reached the water. We saw many wild animals as we passed through these rugged and secluded hollows—several herds of *Ovis Burrhel*, and, for the first time, a few of the larger wild sheep, *Ovis Ammon*; also a large colony of marmots. We got to the water's edge about noon; the altitude of the surface I have calculated to be just 15,000 feet—that is, about 750 feet lower than the summit of Mont Blanc. The temperature of the air was 45°·3; that of the wet bulb, 33·8°; and of the water of the lake, a little over 50°. The latter cannot, however, be taken as the general temperature of the lake-water, for the bottom was very shelving, and it was not possible to reach the deep water. On the following morning, at about 8 o'clock, the water was 37°, and the air 33°; at 10 o'clock, the water was 45°, air 38°, and wet-bulb 29°; and on our return to *Rakas-tal*, three days later, the edge of the water early in the morning was just frozen in some places for a foot or two from the shore, the air-temperature falling to 22°·8.

We were, after all, disappointed in our hopes of being able to go along the edge of the lake, for steep cliffs shut in the little shingly bay into which we had come, and forced us to ascend again over the hills, which had now become so much less rugged that the ground was in parts almost level. At this time, the peaks of *Gurla* and *Kailas* being both quite clear of clouds, and the wind not having yet set in with much strength, I thought the opportunity might be taken to determine the heights of the two peaks trigonometrically. I therefore stopped to set up the theodolite at an elevation which proved to be 15,970 feet above the sea. But before the last angles were measured, the wind had become so dreadful, and we were all so utterly perished with cold, that I was on the point of giving it up as impracticable, and I was not surprised to find, on subsequent examination, that a mistake had been made in one of the angles. This, however, was of no real importance, as the more careful triangulation of the following year has made good the deficiency. The violence of the wind on this occasion may be conceived when I mention that a 100-foot tape, used for measuring my working base, had its ends successively torn off, one after the other, by the mere force of the wind, in the hands of my friend Mr. Winterbottom, while he was endeavouring to draw it straight.

While I was delayed at this job, all the rest of the party went on with the exception of two men and as many jhobus, one for me to ride, and the other to carry the theodolite; and I was only too glad to be off when the last angle was observed and the instrument put back into its box. By the time I came up to our camp it was very nearly dark, and as the tents were pitched in a rather out-of-the-way nook within a few hundred yards of the edge of *Rakas-tal*, and no one had remembered to look out for us, I was as near as possible passing on without finding them. Luckily, I saw a man's head appearing over the top of a hill, and on examination he proved to be one of our people getting firewood. The pleasures of a bivouac in the open air that night would have been questionable, for we found it most miserably cold in the tent, and, contrary to custom, the wind continued to blow nearly all the night. The thermometer at this time was not very low, for when I set up the theodolite at half-past two it stood at 47°, and it was probably not below 32° when I reached our tents; but no clothing will keep out these intolerable winds excepting furs or sheepskins, with which we had not provided ourselves, but which every traveller in Tibet ought to take with him, even in summer.

*September* 16. *From Rakas-tal to Manasarowar*, 14 *miles*.—At 6 a.m., thermometer 20°·8. We started to-day over undulating ground slightly broken up by ravines, and were enabled accordingly to keep pretty near to the margin of the lake. The rock at the commencement of our day's journey was still the old hypersthenic trap, but we almost immediately came upon mica schists and fragments of granite. I cannot positively say whether we passed over any granite *in situ*, but *Gurla*, at all events, seemed in great part to be constituted of that rock. This mountain was now so close to us that the summit was possibly concealed by some outlying spur. The grey granite stood up strangely among the pure white snow, and the pale and spectral masses contrasted finely with the deep reds of the surrounding trap hills and the purples of the *Kailas* rock on the north. A long open slope brought us to *Lagan-Tung-kong*, a small ruined mud hut or dharmsala at the south-east corner of the lake; as we approached, a horseman left it apparently rather in a hurry, and went off rapidly along the road to *Purang*. He seemed as anxious to get out of our way as we were to avoid him, and in a country such as this, where there is no law, still less any police to enforce it, it is not wonderful that travellers are a little shy of making acquaintance with strange parties of men. We were by this time becoming aware of this fact, and began to calculate on not being very rigorously scrutinized by persons whom we might meet by accident on the road. We reached the water's edge at the extreme south-east angle of *Rakas-tal* about 10 a.m., and the wind now blowing lightly from the north, small waves were breaking on the shore. The thermometer was 38° in the shade.

Beyond this point the ground separating *Manasarowar* from *Rakas-tal* rises rather steeply to about 300 or 400 feet above the level of the lakes, being apparently altogether composed of alluvial deposits made up of pebbles, precisely similar to those now found on the beaches of the two lakes, of granite, mica schists, and quartzites, sometimes cemented together and forming conglomerates, but more commonly in the state of loose gravel. The general structure of this alluvial mass is so perfectly identical with that of the deposits of the great plateau that they must all be held to have had a common origin; but it is impossible to offer any opinion as to the probable time at which this particular portion assumed its present position relatively to the rest, whether before, with, or after the general movements that have elevated the whole. On this soil the vegetation was again a little more cheerful than on the miserably barren trap hills we had been passing over for the last three days, but still no novelty was seen. As we reached the summit of this ridge, we at length came into full view of *Manasarowar*, in honour of which event our followers did homage to the sacred lake by prostrating themselves at full length on the ground. All along the roadside—for we were now again following a well-beaten track—were a number of little piles of stones erected by travellers who have passed. A similar custom exists in India, and it has perhaps been introduced into Tibet by Hindu pilgrims. It is said to originate in the fancied sanctity attaching to the construction of a house at any holy spot, and those who are too poor to build substantial mansions get over the difficulty by setting up half a dozen stones one on another. Multitudes of such piles may be seen at Hardwar, raised by the devout Hindus in the bed of the sacred Ganges. The same thing is seen at *Badarinath*, at the point where the temple first meets the eye of the pilgrim coming from the south. These small piles must not be confounded with the larger cairns which the superstitious of so many nations, including the Hindus and Tibetans of the Himalayan regions, raise at certain spots, more particularly on mountain passes. To these every well-disposed traveller adds his contribution, usually a stone, though in some places shreds of rag are seen stuck on a bush, or the pile is made up of twigs instead of stones. Accumulations of all sorts of oddities are often found on

these piles, among which horns and skulls of wild animals, fossil shells, bits of crystal, or eccentric-looking stones invite the sacrilegious attacks of European travellers, and many of my specimens of ammonites are spoils of this description. The Bhotiyas have no scruple in assisting in such proceedings, and I may add that they generally appear to care but little, unless impelled by considerations of temporal expediency, for the superstitious practices of their Tibetan or Hindu neighbours. These votive cairns are by the Tibetans called *Lapcha*, though this word is perhaps more properly applied to a substantial tower built to receive votive offerings.

*Manasarowar* is the Indian name of this lake, which in Tibet is called *Mapham*. It is nearly rectangular in its general form, its shores extending from north to south and from east to west, about 12 and 15 miles respectively. Cliffs rise abruptly from the water only at its north-west angle; on all other sides it seems to be bounded by sloping banks or by a shelving beach. Though in form far less picturesque than *Rakas-tal*, it is, when viewed from the south-west corner, set off by a much finer background of mountains. Towards the east the ranges were difficult to distinguish, nor did I make out any visible depression of any importance for the passage of the road to *Lhasa*, though we know that such exists. The water is, on the whole, of the same intense blue as in the other lake, but some parts showed a quite sea-green colour, a circumstance also noticed by Moorcroft, and caused, I suppose, by shoals of yellowish gravel.

We kept for some distance along the top of the separating ridge, till a hollow that nearly cuts it through caused us to descend to the level of the lake, in doing which we met a party of Huniyas with sheep on their way to *Purang*, but we hurried by unnoticed. This depression in the ridge between the lakes marks the point where the unconsolidated gravel deposits, over which we had been travelling from *Lagan-Tung-kong*, give place to the stratified rocks which constitute the projecting headland on the east shore of *Rakas-tal*, and which are continued across to the cliffs at the north-west corner of *Manasarowar*. Where we crossed the hollow, which was close to the edge of *Manasarowar*, there were one or two small pools of water, around which the surface was muddy and covered with an efflorescence of some salt, which at a little distance gave the whole the appearance of being a solid mass of some white deposit. The outer edges of this mud were pretty firm, but in going on to it rather too far in search of some of the salt, I found, by suddenly sinking up to the knees, that it was soft enough below. Between this muddy flat and the lake is a raised beach of shingle, its top, I suppose, about 6 feet above the level of the water of the lake on the one side, and of the muddy flat on the other, between which it forms a complete raised embankment, having quite the appearance of artificial regularity, and in the middle of it has been built a small *Chorten* tower. Similar raised beaches are to be seen at many points of both the lakes, sometimes of larger dimensions, and sometimes having two or three external subsidiary lines of beach in front of them, indicating variations of level of the water-surface. These beaches are, no doubt, mainly produced by the action of the breakers caused by the violent winds that blow with such great regularity in these regions; but what is the exact reason that they are seen along particular portions of the shore only, I cannot say, nor can I further do more than suggest that their occasional great size may perhaps be in part dependent on the ice, which forms along the shores of these lakes during all the colder months of the year. Many of the lakes and rivers of Russia that are frozen over for several months at a time, are described as fringed with piles of rocks heaped together by the combined action of the waves and the packed ice, and some analogous process may go on here. The breakers formed against the cliffs on the shores of these lakes must be very heavy, as we saw their white heads distinctly at a distance of 6 or 8 miles.

I can now only regret that I have no specific note of their action on the rocks, nor of the size of the boulders they form, though my impression is that the gravel on the beaches was chiefly small.

(*To be continued.*)

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# A JOURNEY THROUGH ABYSSINIA TO THE NILE.*

By HERBERT WELD BLUNDELL.

## APPENDIX.

## NOTES ON GEOLOGY AND ANTHROPOLOGY.

By Dr. REGINALD KOETTLITZ.

### I. Geology.

As the line of our route begins in Somaliland, I must not omit to mention some of the main features observed. At first the condition of the country we passed over was a sandy desert, forming a belt from the seashore for about 12 to 20 miles; this is marine formed, and gradually and imperceptibly rises inland. Much of this sand is composed of disintegrated coral, small and large masses of which lie loose on the surface. Here and there, some 10 miles from the coast, rising through the desert sand are isolated rocky hills, one of which I examined cursorily. It was apparently a granitic boss which had pushed up and displaced the overlying, hard, compact, marbled limestone, which also appeared to have been altered by the heat of the granitic mass. The country then becomes rough and rocky. Gneiss, granites, syentites, and quartzites are the exposed rocks; these are intersected in every direction by veins and dykes of biotite, quartz, etc. Flat-topped hills, more or less isolated, rise on the northward of our route, which are capped with basalt of compact and also vesicular type. A chalky kind of rock was also met with, and the surface occasionally is strewn with loose chips of flint and chert. Here and there, as at Jubuli, a quartzite sandstone, hard slaty rock, and schists occur, these being also permeated with veins of biotite and quartz.

A noticeable and remarkable feature of the country are the extraordinarily deep, but dry river and water cuttings. These sometimes intersect the land in a bewildering manner; they are often broad and deep, with perpendicular sides. This even occurs through granitic rock *in situ*, the rock having become so disintegrated by atmospheric action as to allow the water to thus quickly cut through it, for they are evidently caused by torrential rains. Further inland we passed over considerable plains which were almost flat, and from what I observed I am inclined to think are basalt plateau surfaces which have not been raised like the hills around.

For some distance before we arrived at Jig-jigga, as well as at that place, a chalky limestone appeared very frequently through the surface in an anomalous manner. This I frequently found contained fragments of quartz, sanidine, and quartzite embedded in it. This same substance, or similar, I also found filling up fissures in the basalt, not only on the flat, but also on the sides of hills with the basalt *in situ*, and in a position where it cannot have been recently washed into them, and where it must have been when the basalt I saw it in was first exposed, as at Sobolo. It had all the appearance of having been plastered in, like mortar.

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* Continued from p. 121. Map, p. 308.

After crossing the Abyssinian frontier, and in our journey across this southern portion of that country, two main facts become increasingly apparent. The first is that there have been two great periods of volcanic activity. The earlier, when the basalt masses were poured out, probably mostly through fissures, as sills and dykes, as well as lavas, tuffs, and agglomerates; and the later, when the trachytes, rhyolites, and andesites were discharged as lavas, tuffs, and agglomerates from volcanic vents. The second fact which strikes one is that on the route we followed we traversed only the confines, or edge, of the main great basalt invasion of the surface, for, although further north the thickness and mass of the basaltic beds is enormous, on our route from east to west we saw nothing but the most shallow beds, which every now and then we lost entirely.

Underlying the basalts are for the most part the older schists, with apparently older volcanic rocks, granites, syenites, etc., such as appear on the surface in Somaliland and Beni Shongul. I, however, saw limestones and sandstones underlying and interbedded with the basalts among the range of mountains we traversed between Lake Haramaya and Laga Hardim, as well as at the Mardo pass near Jigjigga. I was, however, unfortunate enough to only once find fossils in any of the stratified rocks met with.

The main masses of the basalt in the districts over which we passed appear to me, in the first place, to extend in the direction of the chain of mountains we traversed between Fyambiro and the Hawash plain, and again at Godoburka, on the other side of the Hawash plain. The former run, roughly, from an east-north-easterly to a west-south-westerly direction. These mountains are for the most part capped with basalt in many tiers or strata, with interbedded tuffs, etc. They do not, however, except rarely, show the distinctly flat, plateau-topped profile; they have more the appearance of high rounded downs, and have a "flowing" outline, as though long ago they had been exposed to ice-action. The denuding action of the atmosphere, sun's heat, and rain must, to my mind, having now seen the effects of this agency in these extremes of latitude, be greater here than in arctic regions and the high north, where the frost is supposed to work such ruin and devastation.

The flat-bottomed valleys between the hills, which are so frequent, are without doubt, for the most part, silted-up lakes. Another main mass of basaltic rock we saw when we arrived at Godoburka, as stated above, where it faces one in the form of a remarkable rampart-like wall, up the steep side of which we had to climb to gain the summit at Balchi, when it is discovered that this surface is the southern extension of the great raised plateaux of Abyssinia. From here one travels upon an undulating plain, but imperceptibly descending, till one arrives at Addis Abbeba. This rampart-like wall extends roughly in a north and south direction; it bounds the Great Hawash valley and plain on the west, while the first-named range bounds its eastern side.

The dark grey to almost black coloured basalt composing the main mass of the mountains on the east side is for perhaps the most part compact, yet very much of it is vesicular, and also contains cavities, which are, in many cases, filled with opalescent and other quartz, etc. The vesicular varieties are met with everywhere, but especially about Laga Hardim and when descending to the Hawash plain, where it is abundant, and where clinker-like rock and basalt pumice can be seen in large quantity. This basalt is also very much interbedded, as above mentioned, with tuffs and agglomerate, the beds being thick and extensive. At Balchi, on the other side, the rock is rather different, being of a dark red to purple colour; * here it seems to lie upon old slatey rock, which is tilted at a high angle, as well as bent and twisted very much.

* Similar rock I also saw on the eastern side near Lake Chercher.

The general dip everywhere appeared to be to the north-west. After the descent from Laga Hardim, the rock met with when crossing the Hawash plain, traversing the Fantalle hills into the Kassam valley, and on to Godoburka, has quite a different character, and apparently belongs to the second great volcanic period, above referred to; it has everywhere a similar appearance to that at Aden and the south of the Red sea. It is probably of the same quite recent age. Masses of trachyte, rhyolite, andesite, etc., lavas, and tuffs are the prevailing rock, the last often soft, so that the passage of the traffic over it so pulverizes it as to cause clouds of dust, which is so fine as to remain long suspended in the atmosphere, and cause very fine effects at sundown, as well as irritate the respiratory passages considerably.

Off Fantalle and Choba southwards, and stretching south-west to Mount Saquela and further, are a number of truncated volcanic cones showing very perfect craters, many of which are small, but there is at least one large one, that of Mount Saquela. It is evident that south of Addis Abbeba and extending north-east in the Great Hawash plain, the basalt disappears and is replaced by the later volcanic rock. I would suggest that the outbreak of volcanic activity which gave rise to these numerous craters and this outpouring of molten material was produced through a line of weakness which had occurred in the Earth's crust here; this line ran roughly north-east and south-west from the south of Addis Abbeba and probably still further to the south-west as far as Lake Rudolf (where I believe there is still an active volcano), and possibly further, and extends to Aden and as far as the Dead sea.

The comparatively recent outbreak of this later phase of volcanic force is especially manifested in the beautiful preservation of the perfect extinct craters, and by the occurrence of hot springs, some of which are in the near neighbourhood of Addis Abbeba. One of the most perfect, as well as the largest, of these crater-topped cones I visited while Mr. Weld Blundell and Lord Lovat were obliged to go north and see the king. This was the holy mountain of Saquela, as above mentioned. It is situated some 40 miles to the south of Addis Abbeba, and is in the form of a truncated cone, rearing itself 2000 feet or more above the level of the surrounding crater-studded, volcanic plain. All round it, branching off its sides, are spurs, or shoulders, which jut out from its main body, and evidence the remains of some of the lava-flows which were ejected from its vent. Its sides are steep and rocky, yet covered with verdure, and, especially on the higher portions, with forest. Upon its summit is an oval, rocky-walled, flat-bottomed valley, a mile to a mile and a half in diameter, and about 200 feet deep, which is partially filled by a lake. The altitude of its summit (10,000 feet above the sea) causes the climate here to be comparatively cold and bracing.

The hot springs close to Addis Abbeba are simply jets of hot water which bubble up through the mud floor, in which they have formed small basins. They are dispersed over a surface of about 100 yards, close to a small rivulet, into which the water runs. There are some twelve or thirteen of them; the temperature of the hottest of them I found to be 76·7 C. (170 Fahr.). They are made use of by sick people afflicted with skin eruptions, rheumatism, and other diseases, who remove their clothing and sit in the basins, where the water is less hot, in full public view, both males and females.

Not far from Addis Abbeba is Mount Managasha, referred to by Mr. Weld Blundell. This hill has all the appearance of having been a volcanic "neck;" it is, however, very much covered and its structure hidden by wood and vegetation.

At Addis Abbeba there is very little basalt, most of the rock exposed in quarries being a whitish-yellow, tuff-like, though hard stone, showing fragmentary

structure, and often having a coarsely columnar arrangement. In river cuttings, however, one can see that a hard compact basalt underlies it in part. For a day's journey west the rock is very similar to that composing Mount Saquela, which has a gabbro-like appearance, and weathers in the same rough fashion. Further west the basalt is thin; in fact, one may consider the Mecha, Sobu, and Kwunche mountains the boundary of its southern extension here. Undoubtedly basalt still covers the surface somewhat south of this, but only in comparatively small quantity, for the volcanic rock of the later period seems to take its place. The surface is, however, modified and coloured by this basalt and its associated tuff, which, though of light yellowish-grey colour, weathers a deep red to purple, and this, with the basalt, gives the soil the same prevailing colour.

The country for the most part continues undulating and down-like as far as Guder, though to the north are the Mecha and Sobu ranges. The latter are then crossed to Chellia. The basalt of the mountains varies somewhat, being coarser and highly crystalline. The plain we traversed between Chellia (Chellahah of Mr. Weld Blundell) and Bilo, at the foot of the Soddo range of mountains, is without doubt again a large silted-up lake, for even now here and there are marshy portions, while the soil all over it is composed of a black sandy loam.

The Soddo range has been upheaved plainly by a comparatively recent convulsion. A large number of faults here run roughly north and south, which have formed escarpments which face east to south-east, and the dip of the strata is to the west and north-west. Further west, after crossing a series of rounded basalt-covered, knoll-like downs, we come to the Didesa river, which here runs from the south-east to the north-west, apparently following a line of faults or displacements of the earth's crust, for the Sarti mountain range, on the west side of this river, and at the foot of which the river runs, is a series of enormous escarpments facing east to north-east. This series of escarpment-forming faults continues very markedly on the further side of this range for more than a day's journey. The same mountain range, with the accompanying river, appears to continue north until it joins the Gumbi mountains, with which it is continuous, and thus bends somewhat to the north-west, while the Didesa river joins the Abai, or Blue Nile.

The Gumbi mountains are of the same or similar rock; they are north-east of Mendi, and bound the valley of the Abbi on the south, at the point where the river bends round northwards towards Fasokl. The upheaval which formed this range exposed to view the rock underlying the basalt, and demonstrates very markedly how very thin the covering of this rock is. The basalt is then seen to lie upon schistose, slatey, granitoid, and gneissic rock several thousands of feet in vertical thickness; this is permeated with quartz reefs, some of which are of enormous extent and thickness.

Similar down-like country continues as far as the Dabus river, the frontier of Abyssinia. The Shangalla country (Bani Shongul) rocks are mainly similar schistose, slatey, granitoid, and gneissic rocks like those exposed in the Sarti mountains, and similar quartz reefs intersect them. Here and there some of the hills have a slight capping of a coarse dolerite. A large portion of the lower country is alluvium.

## II. Anthropology.

Our route, roughly east to west, took us through the country of Somali, Abyssinian, Galla, and Shangalla races. The Somalis are so well known that little that I could mention would be unknown. I will therefore pass them over, and mention a few points about the Gallas, the Abyssinians, and the Shangallas.

Southern Abyssinia is inhabited by Abyssinians and Gallas, as mentioned by

Mr. Weld Blundell. The former are apparently a mixed and non-pure-bred race, their blood being largely altered by the free inter-marriage, which must have been going on for ages, between them and their captives in war; for, being a military people, wars and raids are frequent with them. The Gallas of their own country, the negroes of the Nile basin, the Sudanese, and Arab tribes have all contributed, without doubt, towards the development of the present-day Abyssinian. Hence one meets with individuals resembling the Galla, the Arab, and the negro. They are a muscular, brutal, energetic, though scarcely brave race. They almost confine themselves to their military occupation, for what agriculture, manufacture, and trade there are in the country are mainly carried on and produced by Gallas and foreigners, Indians, Greeks, Jews, etc.

The Abyssinian is pretentious and domineering to his inferiors, yet cringing and obsequious to his superiors. His business being that of a soldier, he is more or less, though at times energetic, a lazy individual; he, though not a trader, is willing to take service as mule-driver and caravan help, but will always shorten his day's work as much as he can. His inseparable companions are his rifle, cartridge-belt, and sword. The first is often of a most antiquated pattern, which, even when mule-driving and performing long marches, remains with him, carried over his shoulder. His sword is strapped tightly to his waist, and is a characteristic one, being short, very much curved (scimitar-like), but narrowing to a sharp point; it is worn on the right side, and thus, when mounting a mule or horse, he always does so on the right or off side. Besides these weapons, he uses in warfare a large round, basin-shaped, embossed leather shield, often ornamented with silver work. He boasts of being a Christian, but the Christianity he professes is only in evidence in the keeping of feast and fast, though a few, very few comparatively, attend church on early Sunday mornings, in response to the call of a doleful, cracked-pot-sounding, tolling bell; and a few also wear rosaries, though I never saw one being used. These rosaries have forty-one beads, said to be symbolical of the number of stripes our Lord received when scourged. Whatever is the cause, the Abyssinian has deteriorated, for apparently he is a much worse liar, thief, and cheat than his neighbours about his borders.

The Abyssinian lives a more or less settled form of life, for he builds a house, though even in a so-called town, such as Addis Abbeba, he pays no rent. This house is of a very primitive type, at least in those parts we visited. It is a circular one, the walls are formed of mud-plastered sticks, while the roof is of grass thatch supported on roughly interlaced branches of trees and sticks. The interior is partitioned off by an inner circular wall; between this inner and outer wall, the rough spare household utensils are kept, as well as a cow or two, mule, or pony. The inner portion, with mud floor slightly raised, is where the family lives; bed places, again slightly raised and formed of mud, are round it; upon these the inmates squat when at home. The fire is laid on the ground, and the kettle or pan is either suspended from above, or more frequently supported upon three or four stones arranged round the few burning sticks which constitute the fire. No aperture, other than the door, is ever made for the entrance of light or the egress of smoke; a more comfortless home it would be difficult to conceive. His churches are of the same kind as his house. They are circular, roughly made, but larger erections, and are surmounted by a cross, a characteristic Abyssinian one: it is composed of two iron (?) crosses arranged stelliform, with a circular band joining and supporting each arm, the extremity of each being globular, and the whole is painted white. Except for this, and that it is larger, as well as for a number of gaudy European-made chromo-lithographs of the Virgin, Christ, and the Saints, with, more rarely, some crude native drawings, attached to the inner circular wall,

there would scarcely be anything to proclaim the sacred purpose for which the building is used.

The Abyssinian priest is distinguished by wearing a peculiarly formed, white turban-like cap, and carries a fly-switch made of horsehair; otherwise his dress is the same as that of the other males. This dress consists of a pair of white cotton pantaloons; a long white cotton cloth which he folds about him, called a shammah, often broadly striped red in its length, or having an embroidered border; and in the early morning, or when it is cold, over this a dark brown long pelisse-like woollen garment called a bornouse. It is joined in front, and has an ample aperture at the neck; the whole is thrown over the head when put on. Not unfrequently a priest will also carry a wickerwork or grass-made umbrella or sunshade, of course uncollapsible.

The women wear a cotton skirt, and a loose cotton bodice, as well as also use the shammah. All walk barefoot, and when riding use the big toe only in the stirrup, which is made just wide enough for its reception. I say *white* cotton pantaloons, shirt, shammah, etc., but it is comparatively rare to see it this colour; for, being a dirty, vermin-infested people, the white colour these garments have when they are new soon disappears, the usual colour being a dirty slate-grey, caused by accumulation of dirt.

Monasteries, so-called, are not unknown in this part of the country; one such I visited when I went to the holy mountain of Saquela. This is, as already mentioned, an extinct volcanic cone, with a very perfect lake-filled crater upon its summit. The monks, or hermits, live in isolated huts embedded in the woods about the top and down the upper portion of its sides, not in a building such as monasteries are generally mentally associated with by most people. They are very little in evidence when one visits the place, yet I understand there are many of them there. They have a semi-maniacal look (those I saw), and are said to spend their lives in prayer and self-mortification. Churches, mostly in very bad repair, are in good number also, dispersed in this forest. It is probably on account of the extraordinary, to the native mind, though natural conditions that this mountain reveals, that it has a certain amount of superstitious attraction to the people in that part of Abyssinia, and thus causes the monks to locate themselves there.

People come from all distances and make pilgrimages to the place, especially the sick and sterile women, for the sake of the supposed healing virtues obtained by drinking the waters of the lake and other springs issuing from the rocky walls of the crater, as well as bathing in the lake.

The Abyssinian is very fond of display and of assuming importance. A man who is well-to-do, a chief, or important personage, never goes out walking; he always rides his mule, and has as large an attendant retinue as possible, who generally walk; these always, if possible, carry rifles. Even the abuna or primate and higher clergy do not neglect to be so attended when going abroad.

Of the few measurements I was able to take, the following is the mean:—

| | |
|---|---|
| Age ... ... ... ... ... ... ... ... | 26·7 |
| Sex ... ... ... ... ... ... ... ... | ♂ |
| Stature ... ... ... ... ... ... ... ... | 5 feet 5·4 inches |
| Length of upper extremity ... ... ... ... ... | 22·3 inches |
| Length between tips of finger when arms are extended ... | 5 feet 8·65 inches |
| Chest girth ... ... ... ... ... ... ... | 34·125 inches |
| Head measurements— | |
| Occipito-frontal ... ... ... ... ... ... | 7·5 inches |
| Occipito-mental ... ... ... ... ... ... | 9·6 „ |
| Bi-parietal ... ... ... ... ... ... | 5·9 „ |
| (The above diameter was 2 inches above and 0·77 inch behind external auditory meatus.) | |

The Gallas were probably the aboriginal inhabitants of the country prior to the advent of the Abyssinians; they are said, however, also to be immigrants. They have been conquered, and are held in subjection by the help of firearms, which their conquerors take care they shall not obtain, and by this device they are kept in a position of distinct inferiority and abject servitude. They are without doubt a much purer race, have fine lithe figures, though spare, and have regular, handsome European-like features. Their hair is crisply curling, similar to that of people of Jewish stock. The hue of their skin varies from a light copper-colour to that of chocolate. They divide themselves into many tribes, according to the district, yet speak a similar language (though, as mentioned by Mr. Weld Blundell, there are several dialects). It was interesting to me to find that our Somali servants (which accompanied us through the whole of our route) could understand, they told me, some of the Galla words used by those people inhabiting the extreme south-west of the country, bordering upon the Sudan, and it points distinctly to a relationship of not very distant date. Other travellers have noted similar facts, I find. That they are of a similar race scarcely admits of doubt, for in feature and build they very much resemble each other. The Somali is darker coloured, however, his skin being of a dark brown to almost black tint; but this is accounted for in the fact that he inhabits a more arid, hot, and desert tract of country, and lives perhaps a more outdoor life, because of his nomadic habits, and thus the sun has acted more upon his skin than upon that of the Galla.

The Galla lives a settled life, has his permanent hut, either among a cluster in a village, or else occasionally apart upon land that he tills. His villages, like those of the Abyssinians, are invariably placed upon the summits or near the summits of hills, which keep him out of the heat of the lower lands, free from mosquitoes and consequent fever, as well as serve for the purpose of look-out and defence. They are the producers and cultivators, being an industrious folk. Around their villages and huts a tract of cultivated country can always be seen, with flocks and herds grazing near. There is no doubt that, if they were not so oppressed and taxed, they would produce more, but the only thing taxed in Abyssinia appears to be the produce of industry, that of husbandry, manufacture, and trade, the result being that these suffer. The Gallas grow cotton, spin it into thread by a peculiarly delicate spindle, and weave it into cloth. Wheat, barley, teff, pepper, coffee, tobacco, vetches, beans, and peas, etc., I also saw cultivated by them. Their huts are similar in shape to the Abyssinian, but, especially in the west, the arrangement of the interior is somewhat different, there being no inner circular wall, only a partition, somewhat back from the door, passing straight across the floor space, sufficient room only being left for use as a doorway; this divides the room into two, the outer acting as a porch, and as a place for keeping household necessaries, while the inner is the cooking part and women's quarter, and where also are the beds, which are screened off by wickerwork hanging screens.

The Galla is said to be pagan, and to worship a god which is in some way connected with a tree or rock. The Abyssinians, however, so despise the Galla, that our interpreters (who were Abyssinians) would not condescend to inquire, or could not obtain the information we asked for. It is possible, also, that, being an ignorant people themselves, they could not comprehend what really we wished to know.

As we moved along our route it was often pitiable to see the servile manner in which the Galla bowed and did homage to us or to our Abyssinian escort, and points to a savage oppression which does no honour to the Abyssinian. Evidence of their dependence and oppression was not wanting in other respects *en route*, for

it could especially be seen by the domineering manner in which a Galla (man, woman, or boy) would be told to give up some of his possessions which he might be carrying. If he did not comply or attempted to remonstrate, it was forcibly taken from him, he was maltreated and knocked down, and his goods confiscated, at least in part. They are evidently in great fear of their conquerors, and have no rights. Because the Galla smokes, which he does from tobacco grown in his garden, out of a kind of long hubble-bubble pipe (with water under the bowl), the Abyssinian does not, for he despises too much anything practised by a Galla. Others give another and religious reason—"because tobacco is born in the tomb of Arius," and is therefore accursed.

The following is the mean of some Galla measurements:—

| Males. | |
|---|---|
| Age ... ... ... | 27 years |
| Stature ... ... | 5 feet 6·6 inches |
| Length of upper extremity ... ... | 22·328 inches |
| Head measurements— | |
| Occipito-frontal ... | 7·49 inches |
| Occipito-mental ... | 9·6 „ |
| Bi-parietal ... ... | 5·7 „ |

The last diameter being 1·9 inch above, and 0·39 inch behind external auditory meatus.

| Females. | |
|---|---|
| Age ... ... | 41·2 years |
| Stature ... ... | 5 feet 3·3 inches |
| Length of upper extremity ... | 21·3 inches |

On account of the stiff wax-and-honey pomaded fashion in which the women do their hair, I was unable to obtain reliable measurements from their heads.

The Shangalla are the people that inhabit the country bordering South-West Abyssinia, on the west side of the Dabus river, and south of the great bend of the Blue Nile. Their country is a hot, comparatively low-lying, fever-stricken, and in part rough and rocky district, yet much of the surface of the country is formed of river alluvium. They are a negroid type of people, are darker coloured to almost black, have thick lips, prognathous face, long arms, and appear to have far less intelligence than the Somali, Abyssinian, and Galla. They are said to be all slaves of Amdurrahman, the Arab chief of the country, and are Mohammedans.

Their district having lately been raided, devastated, and burnt by the Abyssinians, as well as largely depopulated, we saw it under distinctly disadvantageous circumstances. Their houses are, however, very similar in shape and construction to that of the Galla and Abyssinian, yet are sometimes raised upon a platform of mud-plastered sticks and beams, as also their platforms for storing grain—no doubt for the purpose of keeping them and their corn out of the water and wet during the rainy season. There was evidence of much cultivation, judging by the burnt durrha and other cornfields and gardens. These fields and gardens I observed to be sometimes surrounded by a rough thorn hedge, generally not planted, but formed of cut boughs of the thorny acacia or mimosa tree fixed into the ground.

They are armed with spears of a barbed and ugly looking kind, carry a rifle frequently, and also the short dagger suspended to the elbow, which is seen so commonly in the Sudan. Some of them also have a peculiar and unique curved, double-edged, branched sword; to what end this weapon has been developed into this shape I was unable to obtain information. The blade or blades are engraved and marked by ornamental and apocryphal devices. They also have a sort of curved club, or boomerang, like throwing-stick, with which they are very expert in knocking down small animals and birds, etc.; these are very much used by them, for almost every male carries one.

Both sexes are marked by a sort of tattoo, which is produced by gashes made

with a knife. The resultant scar has been made, by using some irritating substance when healing, to protrude above the surrounding skin surface, hence this causes these marks to show prominently. They are specially common on the faces and arms, but are not infrequent on any part of the rest of the body. These cuts are made to assume regular shapes and patterns—in fact, have, on the dark negro skin, a not unpleasant effect.

When wishing to measure the men, who were often standing about doing nothing, for anthropological purposes, they evinced a remarkable repugnance to being subjected to the process, and it was with considerable difficulty that I obtained the few I have, the mean of which I give below.

Both men and women of the Shangalla go about with very little clothing. As a rule, both sexes simply wear a breech-cloth, often of leather, of very small dimensions. Occasionally, I saw some of the men wearing some loose baggy cotton trousers like those of the Sudanese, with a sort of shirt on their shoulders, and Sudanese pointed slippers on their feet; but these are not their natural costume, only borrowed. In all probability these men were personal servants of the chief.

The following is the mean of my measurements of Shangallas:—

| | |
|---|---|
| Age ... ... ... ... ... ... ... ... | 27 years. |
| Sex ... ... ... ... ... ... ... ... | ♂ |
| Stature ... ... ... ... ... ... ... ... | 5 feet 5·8 inches. |
| Length of upper extremity ... ... ... ... ... | 23·08 inches. |
| Length between tips of fingers when the arms are fully extended ... ... ... ... ... ... ... | 5 feet 10·7 inches. |
| Chest girth ... ... ... ... ... ... ... | 33·93 inches. |
| Head measurements— | |
| Occipito-frontal ... ... ... ... ... ... | 7·42 „ |
| Occipito-mental ... ... ... ... ... ... | 9·57 „ |
| Bi-parietal ... ... ... ... ... ... ... | 5·54 „ |

The above diameter was found to be 2·18 inches above and 0·77 inch behind the external auditory meatus.

The Gallas, the stature is greatest (males).
In length of arm, the Shangalla.
In fathom stretch, the Shangalla.
In chest girth, the Abyssinian.
In head measurements—
The occipito-frontal is greatest in the Abyssinian.
The occipito-mental „ „ Galla (male).
The bi-parietal „ „ Abyssinian.
And the bi-parietal diameter is nearest to the ear in the Galla.

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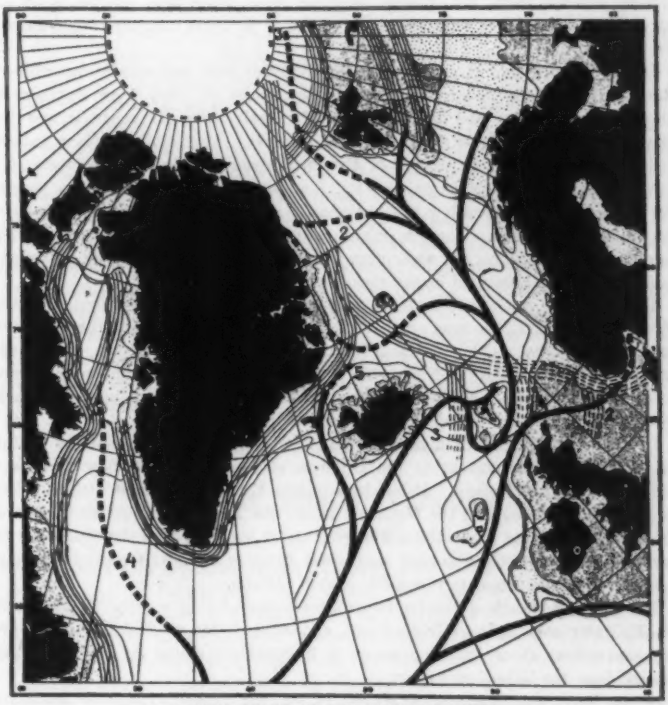
Mr. Weld Blundell's Map.—The road from Addis Abbeba to Dessieh and back is worked out from a plane-table sketch, positions at intervals being fixed by observations for latitude and longitude by sextant. From Addis Abbeba to Famaka observations for latitude and longitude were taken nearly every day by 5-inch theodolite, and details put in from plane-table sketch. The whole checked by Jordan's method of least squares.

## THE DANISH "INGOLF" EXPEDITION.

THE report on the work done by the Danish cruiser *Ingolf* in the seas round Greenland and Iceland during two voyages in 1895 and 1896, is now being published at the expense of the Danish Government. Separate editions are to be issued in the Danish and English languages, and the whole is to be completed in six volumes. The first part of vol. i. has already made its appearance; it includes the narrative of




CURRENT CHART OF THE NORTH ATLANTIC.

GULF STREAM ——— ARCTIC CURRENT ═══ UNDER CURRENT ▪▪▪▪ AND ⣿⣿⣿

1, *Vöringen*, 1878; *Lightning*, 1868; 2, *Hekla*, 1891; *Jackal*, 1893; 3, *Fram*, 1896; *Ingolf*, 1896; 4, *Ingolf*, 1895; 5, *Ingolf*, 1896.

the Expedition, by the commander, Commodore C. F. Wandel, and the report on the physical and chemical work, by Dr. Martin Knudsen.

The chief contributions in the way of new soundings consist of a survey to the south-west of Cape Reykjanes, where the existence of a submarine ridge has been established in the region of the much-discussed Busse Island, from which earthquakes have also been reported more than once. This ridge appears to be of recent volcanic origin, and is merely a prolongation of that forming Cape Reykjanes, where there is still much volcanic activity. A large number of additional soundings have

been made within the 100-fathom line off Greenland and Iceland, and the positions of the banks on the west side of Davis strait have been explored.

The most important novelty in the equipment for physical observations on board the *Ingolf* was the modification introduced by Dr. Knudsen in the reversing thermometer. The older pattern has frequently given trouble through the uncertain breaking of the mercury column, and probably also through the weight of the mercury in the bulb forcing additional quantities into the tube during hauling up. Dr. Knudsen obviates the risk of errors of this kind by simply bending the thermometer into a U form, the column breaking close to the bend, so that when the instrument has been reversed, there is no tendency for more mercury to find its way into the tube.

In the chemical and physical work, the salinities were estimated from chlorine determinations in the usual way. During the cruise in 1895 large numbers of samples were collected and brought home for analysis of gas contents, and the analyses were afterwards carried out by Dr. Rordam. The results of these led Dr. Rordam to suspect that the amount of dissolved oxygen in the waters suffered considerable change after collection, and Dr. Knudsen accordingly devised a special form of apparatus for executing the analyses on board ship immediately after the samples were obtained. The important results arrived at by this means with reference to the evolution and absorption of oxygen and carbonic acid by organisms in sea-water, were published in the *Comptes Rendus* in 1896.

The observing stations of the *Ingolf* are arranged in series of sections, affecting distinct regions: first, the area south of Iceland and Greenland, and the Denmark strait; next the east and north-east of Iceland, northward to Jan Mayen, and southward and eastward across the Norwegian Sea; and lastly round Greenland westward into Davis Strait. Each section is discussed separately, and the circulation in each region is studied by comparing those in each group.

In the first group, much fresh light has been thrown on the relations of the East Greenland polar current to the Irminger stream, or current flowing northwards to the west of Iceland. It had been shown that the Irminger stream splits into two at a point south of the Denmark strait, one arm turning south-westward and accompanying the polar stream along its outer margin round the south-east of Greenland, and the other passing northward through the strait and ultimately becoming an undercurrent to the north-west of Iceland.

The westerly branch of the Irminger stream reinforces the large quantities of Atlantic water sent up into Davis Strait, and even as far as Baffin's bay. Surface observations show that the water is frequently covered by drift moving eastward from the Labrador current.

In the Greenland-Iceland-Jan Mayen region, the *Ingolf* expedition has done very valuable work in bringing out the immense relative importance of the East Iceland polar current. The existence of a southerly movement of water off the east and north and north-east of Iceland has long been recognized, but it has hitherto been assigned a very secondary place in the system of circulation. It is now fully recognized that this current is of very considerable volume, and that its waters may profoundly affect the circulation near the coast of Norway and in the North Sea. There is no doubt that this stream, as well as the East Greenland current, is primarily due to the melting of the pack-ice between Greenland and Jan Mayen, by the warm water moving northward from the Atlantic. Dr. Knudsen is of opinion that the Irminger stream from the north-west of Iceland is responsible for the greater part of this melting, and bases this conclusion on the fact that the temperature of the warm under-layer of water *falls* from the north southward, instead of rising as it should do if the warm water was moving northward from

between Iceland and Norway. It seems possible to explain the temperature observations otherwise, and in any case it is scarcely credible that the enormous volume of warm water sent northward from the eastern Atlantic should cause less melting than the smaller branch of the Irminger stream. This has already been discussed by Prof. Pettersson in a paper on the effect of ice-melting on oceanic circulation (*Kongl. Vetenskaps-Akademiens Handlingar* 1899), and Prof. Pettersson's view is distinctly supported by surface observations.

It being known that the part of the polar stream nearest to the east coast of Iceland actually does move southward, the observations of the *Ingolf* give some new information about its further course, and about the movements more to the northward. Excellent use has here been made of "drifters," or floats, supplementing the temperature and salinity observations. On the voyage from Iceland to Jan Mayen in 1896 twenty drifters were thrown overboard; ten of these have been recovered, including one at the Faeroe Islands, one at Romsdalen on the west coast of Norway, and a third on the coast of Finmark. It does not of course follow that the drifters which started in the polar current remained in its waters all the time, they might have moved southward and then come under the influence of the warm current moving northward from the Atlantic. The general form of the circulation set forth by the surface observations of temperature and salinity made during recent years has shown, however, that at least during the earlier months of winter the polar water covers over the weakened Atlantic current, and makes its way eastward as a surface drift to the coast of Norway, as indicated by the drifters, and even, as was shown by the Swedish investigators in 1893 and 1894, into the Kattegat.

The recent advances in our knowledge of the circulation in this region of the ocean, and the sources from which they have been derived, are well shown in the accompanying sketch-map, which we copy from the paper by Prof. Pettersson, referred to above.

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## THE MONTHLY RECORD.

### EUROPE.

**Industries and Agriculture in Germany.**—In a map published in the December number of *Petermanns Mitteilungen*, Herr Langhans shows in a striking way the distribution of industries and agriculture in the German empire. The map is based on those published by the Imperial Statistical Office, but differs from the latter in showing at a single view the distribution of the two occupations in question, which so far outweigh all the rest that in no single area does even a relative majority of the population devote itself to any other. Thus, even in the great trade centres, the trading population falls short of the industrial. In Herr Langhans' map the areas in which a majority, absolute or relative, of the inhabitants is occupied in agriculture (in which are included gardening, rearing of stock, and forestry) are coloured green, while red is used to denote the industrial areas, the nature of the majority being in each case shown by a difference in tint. In the agricultural areas by far the greater part is shown as possessing an absolute majority devoted to such pursuits, while an absolute industrial majority is of course found in comparatively small districts, the largest being those of Southern Saxony and of Westphalia and the Rhine. East of the Oder the only industrial area, apart from the towns, is the mining district of Upper Silesia, which is entirely surrounded on the German side by agricultural areas. Herr Langhans has treated apart from their surroundings all towns for which separate figures were given in

the census of 1895, and thus brings out clearly, among other points, the fact that in the flat lands of Bavaria industry is almost confined to the towns.

**The "Vogtland" as an Orographical Unit.**—This is the title of one of the recent issues of the *Forschungen zur Deutschen Landes- und Volkskunde*, the useful series which has already supplied so many careful geographical studies of various portions of the German Empire. The Vogtland—so named from its old rulers the Vögte, "guardians" or "administrators," who received their title from the Wends in the twelfth century—lies immediately to the north of the Fichtelgebirge, in the angle between the Erzgebirge and Thuringer-Wald. It has been variously assigned to each of these neighbouring ranges, some considering it merely as the somewhat elevated base of the Fichtelgebirge. The author of the present monograph, Dr. Albert Wohlrab, sets himself the task of showing that the district has an individuality of its own, and to this end he examines minutely its orographical characteristics, basing these, of course, on geological structure. In this respect it is marked by the great development of Palæozoic formations, which in neighbouring districts occupy merely a narrow belt running north-east; and by the fact that it forms a syncline between two great anticlines. The strata have been subject to much faulting and dislocation, which have acted chiefly in two directions, a north-westerly and a north-easterly. These dislocations are seen to have had a potent influence on the general orography of the district, which has the character of a gently undulating plateau, deeply furrowed by valleys, by which last the form and direction of the ridges are determined. The general northerly direction of the streams is the resultant of the two directions, north-east and north-west, which, as already stated, are those of the main lines of dislocation, and the valleys are thus marked by the frequent occurrence of rectangular elbows. The study of the hypsometry of the district, into which Dr. Wohlrab enters minutely, brings out its general character as a plateau, the difference between its average height above the sea and the average elevation of the crests of the ridges amounting to only 260 feet, as compared with 920 feet in the case of the Erzgebirge. Deviations from the general evenness of the heights are due to the petrographical character of certain portions, the elevations being composed chiefly of quartzites, etc. In the eastern part of the district, however, a granitic *massif* breaks the regularity of its character. The last part of the paper deals with the anthropogeography as resulting from the orography of the Vogtland. Its lower elevation than that of the districts to the east and west, and its position at the head of an embayment of the North German plain, mark it out as a natural highway of commerce, whilst its other characters tend to locate roads and settlements on the higher levels, and induce the characteristic ring-shaped form of the villages.

## ASIA.

**Baron von Oppenheim's Explorations in Syria.**—We learn from *Petermanns Mitteilungen* (1899, p. 297) that Baron von Oppenheim, attaché at the German consulate at Cairo, has since June of last year been engaged in explorations in Syria and neighbouring countries, principally in the interests of archæology. From Damascus he visited the summer encampments of the Aneze Beduin, afterwards crossing the Bikah northwards to the Tell Nibi Mindu, and reaching Homs by the eastern shore of the lake. Crossing the Nosairi (Ansarieh) mountains to Masgaf and Hamah, he went east to Salamija, and thence by a zigzag course to Aleppo. During this last stage of the journey he discovered a number of hitherto unknown cities of the Christian-Greek period, with forts and houses still in part standing, and containing finely ornamented stones and inscriptions. Of these copies and photographs were taken. From Aleppo the traveller purposed

to go to the Ancient Harran, and thence make a circuit to the south-east to the reported Jebel Abdul Aziz. Afterwards his intention was to reach the line of the future Bagdad railway by way of Mardin and Diarbekr, and follow it to Konia and Constantinople. He hoped to explore the at present unknown part of Mesopotamia east and west of the Belik, where possibly the remains of old civilization may be found.

**Some Ancient Localities in the East.**—One or two discussions of points connected with the ancient geography of the East have lately appeared. In a reprint from the *Proceedings* of the Oriential Congress at Paris, Mr. St. Andrew St. John brings together some notes on the identification of the ancient Takkola, mentioned by Ptolemy as a mart of the Golden Chersonese, and also alluded to in a passage of the *Milinda Pañha*, a work of uncertain date. Mr. St. John possesses some knowledge both of the languages and coasts of Burma, and with this aid attempts to decide between the rival theories which place Takkola either in the Malay peninsula or in the estuary of the Sittang. The latter view, adopted by Dr. Forchhammer, is contested by the writer, who holds that there is no indication that Taik-kala and Thaton, with the former of which that commentator identifies Takkola, were once frequented ports. He is inclined to agree with Lassen and Gerini in placing the old mart in the Malay peninsula, probably at or near the mouth of the Pakchan river (lat. 10° N.), whence the merchants would cross the isthmus of Kra to the Perimulic gulf. Mr. St. John also discusses other places mentioned by Ptolemy when treating of the coasts of Burma, etc., with some remarks on the ancient Suvannabhumi of the Buddhists, considered by some to embrace the delta of the Irrawadi, but the precise locality of which he thinks has yet to be fixed. With regard to the ancient Argyre and Chryse, he throws out the suggestion that the names originated in the fact that certain races of the region in question prefer silver, others golden ornaments. Dr. G. Schlegel, in notes reprinted from the 'T'oung-Pao' (Leyden: Brill), attempts the identification of several places mentioned in the old Chinese records. One of these, Tan-tan or Dan-dan, he considers the same as the Dondin of Friar Odoric, which has been the cause of so much trouble to commentators. The identification of this with the Andamans he thinks improbable, as Odoric went southwards from Ceylon, and apparently passed the Straits of Malacca before reaching Dondin. According to the description of Tantan by the Chinese geographers, we must, he says, look for a country between Siam and Poli (Sumatra), and thus arrive at the Malay peninsula, where all the products mentioned by the Chinese authors are to be found. Another locality treated of is Kola—possibly the same as Ptolemy's Koli—which Dr. Schlegel shows to be undoubtedly Malacca, this first appearing in the Chinese annals under its present name during the fifteenth century.

**Potanin's Journey on the Chinese-Tibetan Border, 1893.**—Although seven years have elapsed since the date of Potanin's last journey in Western China, no detailed account of the same had been published until the end of last year, when a summary of the chief events of the journey appeared in the *Izvestia* of the Imperial Russian Geographical Society (1899, pt. 4). From this account an outline of the journey, with remarks by Dr. Bretschneider, is given in the first number of *Petermanns Mitteilungen* for 1900, accompanied by a sketch-map of the route followed, and a short account of the previous work of the Russian traveller. This, as Dr. Bretschneider remarks, is too little known away from Russia, and it is much to be regretted that the accounts of Potanin's journeys—second to none for the value of the information they contain—have not been made generally accessible by translation. In 1893, as on former journeys, Potanin was accompanied by his wife, whose serious illness, which in the end proved fatal, curtailed the journey to

some extent, and was also the cause of the long delay in the publication of the results. Other members of the expedition were MM. Beresovsky, Kashkarof, and Rabdanof. From Peking the route *viâ* Singan-fu across the Tsinling mountains to Cheng-tu was taken, the journey being continued by the usual route to Ta-tsien-lu. Here the real work of the expedition began, the ground chosen being the almost unknown mountain region to the north of the frontier post just named. Ascending the Tung-po ho, a tributary of the Ta-tsien-lu river, past several Tibetan villages, Potanin crossed the Ta-pao Shan by a pass some 14,000 feet high, and proceeded down a valley to the town of Rumi-jangu, on the bank of the Ta-kin ho, or Great Gold river, which, joining the Siao-kin ho, or Little Gold river, forms the Tatu ho of Chinese maps. The further route lay up the valley of the Little Gold river past various villages and small towns, inhabited by Chinese and Tibetans, and each having a Chinese and a Tibetan name. The district is known to the Chinese as Kin-chuan, or the "gold valleys." In this region the Russian party had been preceded, in 1891, by the Austrian traveller Rosthorn,* the first account of whose journey appeared in the *Mitteilungen* of the Vienna Geographical Society for 1895. Rosthorn, an official of the Chinese customs service, reached the Little Gold river from the east by way of Kuan-hsien, and continued his journey westward to the upper valley of the Great Gold river. The "gold valleys" were also visited in 1896 by members of the Lyonese Commercial Mission. Potanin continued his journey across the divide at the source of the Little Gold river, and passed through the Miao-tze country to Li-fan-fu, visited by Captain Gill and Mrs. Bishop. Dr. Bretschneider's explanatory remarks deal with various points connected with the history and ethnology of the country, some, *e.g.* the list of all European travellers who have visited Lhasa, not immediately connected with Potanin's journey.

**M. Klementz's Journeys in Western Mongolia.**—Among recent Russian travellers in Central Asia few have been more active and enterprising than M. Dmitri Klementz, who since 1885 has traversed Western Mongolia in all directions, from the sources of the Obi and Irtish to the Selenga and upper Amur. His reports have mostly been published in Russian, so that the *résumé* of all his journeys down to 1897, which he contributes to the third part of the Paris Geographical Society's *Bulletin* for 1899, is of much interest. Since 1897 M. Klementz, as already noted in the *Journal* (vol. xiii. p. 658), has turned his attention to more southern parts of Central Asia. His earliest journeys (1885–91) took him to the regions of the upper Obi and Yenisei, where he explored some quite new ground and made many corrections in the maps, especially as regards the Kemchik, a western tributary of the upper Yenisei. During his explorations he repeatedly crossed the Sayan mountains, and brought to light new facts respecting the geology of the range. It is formed of two great folds, the northern part consisting of talcous, chloritic and clayey schists, overspread by limestones, while in the south a clayey conglomerate and schists with fossils, probably of Cambrian age, are met with. In the valleys of the Kemchik and Ulukem, which lie between the Sayan and Tannu-ola chains, eruptive formations occur. The vegetation of this region is intermediate between the forests of Siberia and the Mongolian flora, larches forming the chief component of the forests. The inhabitants are the Soyots, placed by Castrén among the Samoyedes, but who seem to differ much among themselves, those of the valleys (shepherds) being very distinct from those of the mountains (hunters). Between 1891 and 1896 M. Klementz explored the

* The latter paragraphs referring to Rosthorn's journey have been evidently misplaced in the German article, occurring in the midst of the description of the opening stages of Potanin's journey.

region of the Orkhon and Selenga, visiting in 1892 the ruins (comparable to those of Karakorum) on an island in Lake Teri-nor. In this region the rocks are everywhere crystalline. During these and subsequent years M. Klementz travelled extensively in the Khangai and Southern Altai systems, of the physical features of which he gives a sketch. The Khangai, although of a considerable average altitude, contains, with the exception of the Otkhon Tengri, no important peaks. Geologically, it consists of a series of folds falling abruptly to the south, while the valley separating it from the Altai has a trench-like form. The range is marked by the great development of eruptive formations, including some extinct volcanoes. The vegetation of the two slopes differs greatly, larch forests occupying a large area on the north, while forests are rare on the south. On the Altai they occur only in sheltered valleys. This range is formed, in M. Klementz's opinion, of a series of folds, inclined towards the south, the dip being abrupt in the Dzungarian Gobi. The paper is accompanied by a map based on Russian sources, showing all M. Klementz's routes. The mountains are not inserted, it being pointed out by M. Aitoff, in a note appended to the article, that the orographical features as delineated by Russian cartographers are largely fanciful.

## AFRICA.

**The Tanganyika Expedition.**—The following letter, dated Kibita, Tanganyika, November 4, 1899, has been received by Sir John Kirk from Mr. J. E. S. Moore, the leader of the Tanganyika expedition:—"I have just returned from the north end of Lake Tanganyika, where I have left the loads, etc., and where I am glad to be able to tell you that I found it quite possible to go north over the tracks originally arranged. I am also glad to be able to tell you that Fergusson has got a lot of observations which show Tanganyika to be a long way out in the old maps in places. We have also obtained a number of new fish and other forms, which will certainly be interesting from the point of view of the origin of the marine forms which Tanganyika possesses." An interesting communication with map has also been received from Mr. Fergusson, which will be published in the next number of the *Journal*.

**Exploration in the Sobat Region.**—The following letter, dated December 20, 1899, has been received from Major H. H. Austin, who is accompanied by Lieut. Bright:—"As during the last few weeks, during our journey up the Nile, we have been able to fix some points with tolerable accuracy, some of the results we have obtained may be of interest to the Geographical Society. We have now been able to fix the true position of Omdurman by telegraph with Cairo. The point taken was the Khalifa's house, near the Mahdi's tomb. Times and observations were taken by Colonel Talbot, R.E., and myself at Omdurman, whilst Captain Lyons, R.E., officiated at the Cairo end of the line. The position of Omdurman now fixed, viz. long. E. 32° 29′ 42″·5 and lat. N. 15° 38′ 15″, differs very materially from the previously accepted position of Khartum, which is only some 2 or 3 miles distant, near the junction of the White and Blue Niles. Ravenstein, I think, accepts E. 32° 45′ as the position of Khartum. Goz Abu Guma, another place on the White Nile south of Omdurman, was fixed by Colonel Talbot and myself by telegraph as long. E. 32° 41′ 37″·5 and lat. N. 13° 10′ 54″·2, on my way up the Nile. Marchand's fort at Fashoda, which is built inside Gordon's old enclosure, I made E. 32° 7′ 37″·5 and N. 9° 53′ 21″·2, whilst Sobat fort, near the junction of the Sobat with the White Nile, I made E. 31° 33′ 36″·7 and N. 9° 21′ 48″·5. I have taken a whole series of other points along the White Nile and Sobat, but as these may be difficult to locate, it is scarcely worth my while sending them to you. As I have really good instruments and watches with me on this trip, I hope to get some reliable work done between the Sobat and Lake Rudolf, which I am now making for, to join on with my old

work done last year from the Mombasa end. If successful, we shall have a thorough survey done practically from Mombasa to Omdurman. I cannot yet say definitely what route Bright and I will follow until we come in contact with difficulties ahead; but, roughly, we propose following the Ajouba down from its junction with the Pibor to near its source in the Abyssinian hills, when we shall strike south to Lake Rudolf. On the return journey we hope to investigate another route north, along the base of the Abyssinian plateau to Gumbila or Gore, on the Baro river, which we propose following down to Nasser. If all goes well we hope to be back at Nasser early in June, and home perhaps a month later. Lieuts. Gwynn and Jackson, R.E., are working up the Blue Nile from Omdurman, and will join on to the southern portion of the survey to be carried out by me, probably both at Gumbila and Nasser, so that portion of the Sudan should be accurately known. Telegraphic positions of both Wad Medani and Roseires on the Blue Nile have been fixed; but I have not the results, so am unable to give them to you. It is an extraordinary low Nile this year, and the waters of all the rivers are as low as usually two months later in the year. It is not a bad thing as far as I am concerned, as I hope to be able to cross large areas shown as swamps, provided that the tall rank grass has been burnt by the natives. We shall probably traverse country previously visited by both Bottego and Wellby, so I fear we shall not be able to make any new discoveries like they did, but still I hope will be able to fill some blanks still existing in those regions. It may be of interest to you to know the strength of the party with Bright and me. We have an escort of 22 men of the 11th Soudanese Battalion under a native officer, and 24 Jehadin, or ex-dervishes, also armed, in charge of the transport animals. We muster about 50 blacks all told, including servants, besides ourselves. For transport we have 120 donkeys, 7 camels, and 10 mules, as we must be capable of carrying at least two months' supplies of food for the whole column in this inhospitable region."

**Mr. Grogan's Journey from the Cape to Khartum.**—The letter from Mr. A. H. Sharp, printed in the December number of the *Journal*, gave some particulars respecting the first stages of the expedition undertaken by him and Mr. E. S. Grogan to the country north of Lake Tanganyika, where, among other geographical work, the course of the Rusizi and Lake Kivu were mapped. Mr. Sharp, it will be remembered, was obliged to return home by Uganda and the East coast, but his companion remained behind in the hope of continuing his journey down the Nile to Khartum. In this he has been successful, telegrams from Omdurman announcing his arrival at that place on February 8. From Lake Albert Edward, Mr. Grogan went down the Semliki, and by the west shore of the Albert Nyanza to the Nile, which he followed as far as Bor. Thence, to avoid the swamps, he made a detour through the Dinka country to the Bahr-el-Zeraf, which he struck 30 miles from its junction with the Bahr-el-Jebel. Having reached the base of Major Peake's expedition for the cutting of the *sudd* on the Bahr-el-Abiad, he continued his journey by the central channel of the river. Mr. Grogan is now, we believe, on his way to this country.

**French Expeditions in the Sahara and Central Sudan.**—After many rumours of disaster, news has at last been received of the safe passage of the Foureau-Lamy expedition across the Sahara to the central Sudan. Passing through Air, M. Foureau arrived at Zinder by a route not traversed by Europeans for nearly fifty years, the great expedition of Richardson, Barth, and Overweg, which reached the Sudan by this route in 1850–51, being, in fact, the only previous enterprise which had met with success in this direction, while the last traveller to penetrate so far as Air had been the German Erwin von Bary (1877). Zinder, the important point of rendez-vous for caravans across the Sahara, both from

Marocco and Tripoli, had already been reached by Lieut. Pallier in command of the re-constructed Voulet-Chanoine expedition, by which it had been occupied, in spite of some slight opposition on the part of the inhabitants. Some account of the expedition appears in the February number of the *Revue Française*. The murderers of Captain Cazemajou (*Journal*, vol. xii. p. 316) were found and executed, but an attempt to push on to Lake Chad was frustrated by a mutiny among the native auxiliaries. The leader of the expedition, who led the mutineers back to the Sudan along the line of the Anglo-French frontier, found the whole country to the north of that line exceedingly barren, the last villages and wells occurring just on the frontier. The expedition of M. de Béhagle, which was endeavouring to reach Lake Chad from the south (*Journal*, vol. xiv. p. 320), has also encountered difficulties, and its leader has, according to recent accounts, been made prisoner. He appears to have ventured into the territories of Rabah with only six followers, and to have been arrested on approaching Dikoa, Rabah's capital. M. Prins, the French resident left in Bagirmi by M. Gentil, seems to be still with the Sultan of that country, and to have, during the last three years, done some exploring work in the Shari basin. The latest news is to the effect that Rabah's army has been defeated by M. Gentil, and that Rabah himself is a fugitive.

**The British Niger Territories.**—The administration of the Niger territories was, on January 1, 1900, formally taken over on behalf of the British government from the representatives of the Royal Niger Company. The subdivision of the territory will in future be different from that which has hitherto held good. The Niger Coast Protectorate receives an accession of area, and is now known as Lower Nigeria, extending up the river to the neighbourhood of Idda. The colony of Lagos also gains an extension, being carried northwards to about the 9th parallel. The rest of the territory formerly administered by the Niger Company is now known as Upper Nigeria, of which Colonel Lugard has been appointed governor, that office in Lower Nigeria being held by Sir Ralph Moor, previously Commissioner and Consul-General for the Coast Protectorate.

**Delimitation of the Dahome-Togoland Frontier.**—The French section of the mixed commission for the delimitation of the boundary between Dahome and Togoland, has lately returned to France, after completing its labours, which have occupied the greater part of two years. A short account of the work of the commission, headed on the French side by Captain Plé, and on the German by Baron de Massow (succeeded after his death by Dr. Priel), appears in the February number of the *Revue Française*. The delimitation was carried out amidst great difficulties, arising from the excessive rainfall, and occasional hostilities with the natives, as well as from divergences of opinion between the representatives of the two nations. Some portions of the line of country through which the frontier passes were previously quite unknown, so that the surveys accomplished will result in some additions of geographical knowledge.

**The Upper Basin of the Old Calabar River.**—A large-scale map embodying the surveys of the active explorer, G. Conrau, in the upper basin of the Old Calabar river, is given in the fourth part of the *Mitteilungen aus den Deutschen Schutzgebieten* for 1899, with an explanatory note by Max Moisel. Herr Conrau's first surveys in this district were made some years ago, but were revised during 1898, while in that year and in 1899 the traveller followed an entirely new route through the districts of the Bangwa, Kabo and Basosi tribes, whose names have not appeared in any previous map. This route seems to have kept for the most part to the lower forest-clad country, traversed by the Manyu or Upper Old Calabar river and its feeders, which together occupy a fan-shaped basin with a general slope to the north-west. At his furthest point in the Bangwa district, however, the traveller

gained an altitude of 4500 feet, the hills being there grass-covered. Parallel to the route on the south-east, the map shows a mountain range 4500 to 5000 feet high, though whether this was seen by Herr Conrau does not appear, a similar range having been shown on previous maps, though placed in these further to the south-east. The head streams of the Old Calabar have been previously shown incorrectly, the Mbu, *e.g.*, which flows north, having been marked in former maps as flowing west. The map gives many details as to the geology of the country, together with a number of altitudes obtained by careful boiling-point observations.

**Journey in Merere's Country.**—Captain Prince, who has done much to improve the knowledge of outlying parts of German East Africa, has recently explored the neighbourhood of the upper Ruaha valley, and an account of his journey appears in the *Deutsches Kolonialblatt* for November 1 last. After visiting Uhenga and Gaviro, districts of Ubena, and settling a dispute between the Sultan Merere and his brother, Captain Prince went north, and soon after left the undulating grass-lands characteristic of Ubena and entered the level plain of the Mpangali, or "Great Ruaha." After a strip covered with bush this formed an almost treeless plain, extending as far as the eye could reach, and utterly desolate during the dry season but for the vast herds of game, principally zebra and antelope. Captain Prince recommends that this district should form a reserve for zebra, the shooting of which by Merere's people he prohibited. Merere has lately formed a few settlements on the steppe, but there are none on the banks of the Mpangali. This stream was ascended to its junction with the Bavali and Kimara, being everywhere navigable during this distance, but passing through a monotonous yellow plain, heated by a scorching sun. Beyond Muhenjero, where the above-mentioned streams join the Mpangali, trees and cultivation were again met with in the district of Donjera. The people here have both round huts and "tembes," the first for the dry, the second for the wet, season. Crossing a number of copious clear-water streams and an uninhabited stretch of bush, Captain Prince reached Utengule, which was being rebuilt by Merere on its old site after suffering many vicissitudes at the hands of predatory tribes. He also visited a new settlement on the west frontier of Merere's country, formed there by the Usafa escarpment. The pass by which Usafa is reached appeared an easy one, and Captain Prince thinks it might afford a good route from Nyasa to Rukwa and Tanganyika. He then traversed the country lying along the northern escarpment of the Kinga mountains—a well-watered tract which had suffered less than other districts from the prevailing drought—afterwards again entering Merere's country, and carrying his survey back to his starting-point near Gaviro. During the journey the ravages of small-pox were everywhere apparent, but inoculation has now been carried out on a large scale.

**Major Gibbons' Expedition.**—The latest news received in this country from Major Gibbons shows that the traveller has, since last heard of, made some progress in his proposed journey to the source of the Zambezi. On October 6 last he was in south latitude 11° 37′, east longitude 23° 30′, a position, according to existing maps, near the Liba river, a little east of Lake Dilolo. This was about ten days' journey from the sources of the river, where he hoped to meet Captain Quicke, who was to have first explored the Upper Loenge or Kafukwe. Major Gibbons still adheres to his plan of pushing on *viâ* Tanganyika and the Upper Nile to Khartum. Captain Hamilton has joined his regiment in South Africa. He had visited the Mashukulumwe on the Lower Kafukwe as well as some striking falls on that river, which plunges 70 feet through a rift only 18 feet wide.

**North-Eastern Rhodesia.**—This is the official title of the eastern part of the British territory north of the Zambezi within the sphere of the British South Africa Company. An order in council, dated January 29, 1900, which gives

instructions for the administration of this territory, lays down its boundaries as follows: On the west the Congo Free State and Barotziland-North-Western Rhodesia (the latter comprising the western portion of the British territory defined by a previous order in council). On the south the Kafukwe and the Zambezi down to the mouth of the Loangwa; the latter northwards to 15° S.; and the Anglo-Portuguese boundary to the frontier of the British Central Africa Protectorate. On the east the last-named frontier; and on the north the Anglo-German frontier, the south shore of Tanganyika, and the southern frontier of the Congo Free State to Lake Mweru, including the island of Kilwa in the British sphere.

**Expedition in Northern Rhodesia.**—A successful expedition to the least known parts of northern Rhodesia was last year carried out by a prospecting party under Mr. George Grey, who was accompanied by four Europeans. The expedition left Bulawayo on April 5, 1899, and crossing the Zambezi, went north through Minenga's country to the Kafukwe. Beyond that river the route led through districts hitherto little explored, in which five months were spent. Friendly terms were maintained with the natives throughout, and the travellers returned safely to Bulawayo at the end of November.

## AMERICA.

**The Names of the Larger Features of North America.**—A discussion has lately been set on foot by Prof. Israel C. Russell, with a view of securing the adoption of a systematic nomenclature for the larger geographical features of North America, and especially for the three great natural divisions of the continent. Prof. Russell's original paper, with remarks on the subject contributed by Dr. G. M. Dawson, Major J. W. Powell, Prof. W. M. Davis, and others, is printed in the *Bulletin* of the Geographical Society of Philadelphia for November, 1899. The suggested system is mainly based on Prof. Dana's classification of mountains, which, proceeding from the simple forms to the more complex, distinguished in turn peaks and domes, ridges, ranges, systems, chains, and cordilleras. The last-named, being applied to the largest group of all, is used by Prof. Russell to designate the two great mountainous regions of the east and west, under the respective titles Atlantic and Pacific cordilleras. For the central region of plains and plateaux he suggests the term "North American basin." The replies of the various geographers to whom reference was made on the subject, show the difficulty of attaining general agreement in a question of the kind, some of the referees deprecating the adoption of any rigid nomenclature, and others objecting to the particular terms proposed. The use of the term "cordillera" in the way suggested meets with general disapproval, and the terms "Atlantic" and "Pacific" also find little favour. The best suggestion for the two great mountain regions seems that of Prof. Davis, who proposes to call them "Eastern and Western Highlands." The adoption of any collective term for the western region is deprecated by Prof. Heilprin, on the ground of the great structural and physiographical differences between the component parts. For the central region "plain" is preferred to "basin" by Dr. Dawson, while Prof. Davis suggests "medial basin" or "depression" as shorter and more convenient than Prof. Russell's phrase. Other suggested terms are "the great central plain," and the somewhat clumsy expression "Continental drainage areas." To the three regions already mentioned Prof. Dawson would add a fourth, consisting of the Laurentian plateau or "shield."

**Forest Conditions of Porto Rico.**—A report entitled "Notes on the Forest Conditions of Porto Rico," by Mr. R. T. Hill, of the U.S. Geological Survey, has recently been issued as Bulletin No. 25 of the Division of Forestry, U.S. Department of Agriculture. It embraces the results of observations made by Hill in January, 1899, and contains a statement of the forest resources of Porto

Rico and the extent of its timber lands, with succinct descriptions of the physical features of the island. Porto Rico was originally covered by forests, but is now largely deforested from a commercial point of view. The cultivation of sugar, coffee, and tobacco, the three staple agricultural products of the island, in addition to a number of minor cultivations, have resulted in large areas of the surface being denuded of trees. The original forest has been preserved on the summit of El Yunque, the highest peak of the island, situated near the north-east end. Here the rainfall is very heavy, averaging 120 inches per year. A few insignificant patches of culled forest also occur in the central and north-western portions of the island. So far as was observed, the island presents two strongly marked and contrasting zones of vegetation. One includes the whole of the mountains and north coast, described as a region of great humidity, high altitudes, and stiff clay soils, and where the general growth consists of deciduous trees of many species; and the other is the foothill country of the south coast, a region of dry calcareous soils, seasonal aridity, and low altitude, where the flora is largely of the type of low, shrubby, thorny, leguminous, and acacia-like trees. The island appears well, adapted to the growth of trees, and in the author's opinion could be rapidly reforested. A number of characteristic views of Porto Rico and a relief map of the island illustrate the report.

**Dr. Carl Sapper in Nicaragua and Costa Rica.**—In a communication to the Berlin Geographical Society (*Verhandlungen*, 1899, No. 10), Dr. Carl Sapper describes the principal results of a journey in Southern Central America made by him in the early part of last year. They consist chiefly in material for the elucidation of the geology of that region, although some corrections of existing maps as regards topography were also made. Dr. Sapper climbed a number of the volcanoes of Nicaragua and Costa Rica, and in Chiriqui, across the frontier of Columbia, he made the first ascent of the volcano of the same name. In Nicaragua he travelled from San Ubaldo (on Lake Nicaragua) to Agua Caliente on the Rio Mico, and thence *viâ* La Libertad and Matagalpa to Leon. The districts passed through on this journey consist almost exclusively of recent eruptive rocks, which also prevail in Northern Costa Rica. Towards the south-east of the latter, the central Cordillera consists chiefly of older eruptive rocks, while sedimentary deposits —including limestones, and tertiary marls, sandstones and conglomerates—occur both in the south-west of Nicaragua and in the coast Cordilleras of Costa Rica. In Chiriqui, a central mountain core of old eruptive rocks is flanked by more recent rocks of the same origin. The Chiriqui volcano lies on the southern slope of the former. The zones of climate and vegetation are more regular in Southern than in Northern Central America. Moist primæval forests occupy the Atlantic slope, varied in places only by tall grass and bush, while the Pacific slope is characterized by dry forests passing here and there into bush-covered steppes or savannas. The southern limit of pines runs in Nicaragua through Muy-Muy and the volcanoes Viejo and Chichigalpa. In the province of Guanacaste (Costa Rica) forms characteristic of Northern Central America are still seen, while in the rest of the republic South American types occur. Dr. Sapper came in contact with various Indian tribes, paying special attention to the Chiripos, Bribris and Guatusos of Costa Rica. The new topographical data refer chiefly to the department of Cheritales in Nicaragua; the Nicoya peninsula, and other ports of Northern Costa Rica; and the region of the upper Estrella and Chiriqui.

**Prof. Hatcher's Explorations in Patagonia.**—We learn from *Petermanns Mitteilungen* that Prof. Hatcher, Curator of the Museum of Princeton University, whose first expedition to Patagonia was noticed in the *Journal* for 1898 (vol. xi. p. 72), has since returned twice to that country, whence he has lately brought

home a large amount of valuable information respecting the geological structure of the country. In 1898 he examined the neighbourhood of Punta Arenas and the region of the source of the Deseado. After returning home for a month, Prof. Hatcher started on his third journey in December of the same year, this time turning his attention to the upper region of the Santa Cruz river and the east coast.

### AUSTRALASIA AND OCEANIC ISLANDS.

**The "Albatross" Expedition to the Pacific.**—*Science* of January 19 last publishes a second letter from Dr. Agassiz dated Papeete Harbour, Tahiti, November 6, 1899, giving further particulars of the work of the *Albatross* expedition. While at Papeete an examination was made of that part of the barrier reef of Tahiti, which had been surveyed by the *Challenger*, with the result that the condition of the outer slope of the reef was found to differ from its description as given in the *Challenger* narrative. The growing corals were comparatively few in number. Point Venus was also visited for the purpose of examining Dolphin bank. Only a few corals were found growing on it. The party left Papeete on October 5 for the Paumotus, and an extended examination was made of the group. Makatea, which had been visited on a previous occasion, appears to have been subject to a great amount of denudation and erosion. Here a depression was found from 40 to 50 feet lower than the rim of either face of the island, and deeper at its southern extremity. After leaving Tahiti over a hundred soundings were made. These soundings indicate that atolls do not necessarily rise from very great depths. The deepest sounding among the Paumotus was on the line to the northward of Hereheretue, in the direction of Mahetia, where a depth of 2524 fathoms was obtained. All the islands examined are formed of tertiary coralliferous limestone, which has been elevated to a greater or less extent above the level of the sea, the greatest elevation being at Makatea, about 230 feet. Dr. Agassiz discusses at some length the structure and mode of formation of Paumotu atolls, and a large number of photographs were taken to illustrate this subject. The paucity of surface animal life in the Paumotu area is pointed out as remarkable. On November 4 the party were well on their way to Mehitia, the eastern-most of the Society islands.

**Supposed Fluctuations of Level in Samoa.**—Many observers have pointed to phenomena in Samoa which are supposed to indicate the occurrence of recent upheavals and depressions of the surface of the islands. The subject is discussed in the first number of the new volume of *Petermanns Mitteilungen* by Dr. Augustin Krämer, who during his journeys in Samoa has carefully examined the ground for proofs of such changes of level. His conclusion is that the phenomena observed can in no way be considered as establishing the fact of such movements, all of them being capable of other explanations. Dr. Krämer has made the whole circuit of Savaii on foot, aneroid in hand, by rough paths leading at times over spurs of the interior mountains. The ways often pass for miles over smooth blocks of basalt, from one to another of which it is necessary to step, with constant danger of slipping. In places the going is made easier by the presence of slabs of coral, the rough surface of which gives firmer foothold. These coral blocks found at some height above the sea have been taken as proofs of elevation, but Dr. Krämer thinks that they have been transported by the inhabitants, as the underlying rock is not coral, while they are never found far from the paths, and coral reefs are always to be seen on the coast in their vicinity. The coral blocks seen by Stübel inland from Apia near the temple of the cuttle-fish god are thought by Dr. Krämer to have been transported in connection with the worship formerly carried on there. At Cape Tapaga (Upolu) he found no trace of limestone rock *in situ*, such as is

spoken of by Dana, while fragments of coral found near the summit of Fanuatapu island, a steep volcanic rock off the cape, may, he thinks, have been carried there, as is stated by the natives, during hurricanes. Discussing the cause of the waterless nature of Savaii and Western Upolu, Dr. Krämer ascribes it rather to the slight inclination of the surface than to its recent volcanic origin. Although inferior in picturesqueness, in its inland parts, to Upolu, Savaii stands first as regards its coast scenery, with its cavernous recesses, spout-holes, etc., which Dr. Krämer describes enthusiastically. As regards the encroachments of the sea on the sand-beach in parts of Savaii, he sees in them no evidence of sinking, but rather of a slow destruction by the sea of land formerly created by the same agency, possibly owing to increased violence of storms within recent years.

**Journey in Celebes.**—The well-known missionary in Celebes, A. C. Kruyt, has lately made a journey across the eastern peninsula of the island from the gulf of Tomini to that of Tomori and back, the chief results of which are described in a letter published in the December number of *Petermanns Mitteilungen* (1899, p. 297). From Posso the traveller, accompanied by Dr. N. Adriani, went by sea to Uwekuli, a place near Tojo, crossing thence by land to the gulf of Tomori and sailing down the coast to the large river La (Tampira of the maps). This was ascended for two days, when a halt was made to allow of an arrangement with the chief of Tomori for the continuation of the return journey to Posso. This was satisfactorily accomplished, the chief, who had never before come into contact with Europeans, proving a fine specimen of a native potentate. He has not yet embraced Mohammedanism, though much under Buginese influence. Besides exploring the La (a larger stream than the Posso) and its tributaries, the travellers discovered the lake heard of by Sarasin under the name Lowo, which is drained by the Ngangalovo. It lies not north but south of the La, and is merely a piece of flooded grass-land only 2–3 feet deep in the dry season. In the rainy season its eastern part is connected with the La. The latter traverses an enormous grassy plain about 450 feet above the sea, lying north of the Mori mountains. The journey resulted in a better knowledge of the mountain and river systems of this part of Celebes, while important linguistic and ethnological material was obtained.

**Dr. Koch's Expedition to Java and New Guinea.**—Dr. Koch, who has undertaken a journey to the East for the purpose of malaria investigations, has spent some time in Java before proceeding to New Guinea. He visited the Sanatorium at Tossari, 5600 feet above the sea, and obtained samples of the blood of patients for the purpose of studying the malaria bacillus. He has now proceeded to his further destination.

**Miangas Island (Meangis of Dampier).**—A difficulty has long been felt in identifying the Meangis island, first mentioned by William Dampier as lying, with two more close by it, within 20 leagues of Mindanao, and abounding in gold and cloves. Many (including Valentijn) have supposed that the Nanusa group was referred to, while others have considered the island quite mythical. The question is discussed in the twelfth number of *Petermanns Mitteilungen* for 1899, by Prof. A. Wichmann of Utrecht, who points out that in addition to Dampier's account there are other authorities, dating from the early part of the nineteenth century, for the existence of an island of similar name apart from the Nanusas. To settle the question he applied to Herr E. Steller, a missionary long resident on the island of Sangi, who informed him that Meangis really existed, and that in 1895 it was examined and its position fixed by a Dutch ship, proving to be identical with the small island known as Palmas in the time of the Dutch East India Company, which is between the Nanusas and Mindanao. The true name is said to be Miangas. Dampier was wrong in saying that there were three islands, but Prof. Wichmann quotes Carteret

(who calls it Hummock island), as stating that from a distance it appears like several islands. In Homem's map of the Moluccas of 1568, the island for the first time appears as "I. de Palmeiras," while in subsequent maps the names "Y$^{a}$ de Cocos," "Isla de Palma," also occur. The form "Palmas" has survived in some modern maps.

### POLAR REGIONS.

**Dr. Otto Nordenskjöld's Proposed Antarctic Expedition.**—It is stated in the first number of *Petermanns Mitteilungen* for the current year that Dr. Otto Nordenskjöld, who is already well known for his explorations in Southern Patagonia, has arranged a programme for an antarctic expedition, on which he hopes to start in July, 1901, simultaneously with the German and English parties. His field of operations will lie to the south of South America, and he proposes, after pushing southwards in the summer of 1901-2, to establish a winter station on the South Shetland islands.

### MATHEMATICAL AND PHYSICAL GEOGRAPHY.

**Prof. de Lapparent's Treatise on Geology.**—Prof. A. de Lapparent has recently published the fourth edition of his great work on geology,* and in several respects it is deserving of notice from the point of view of the geographer as well as of the geologist. The author has the honesty and the courage to change his mind in the present edition on several points, the new evidence regarding which has shown him that the earlier position was untenable. The most thorough change in the work is the subdivision of the great geological systems and the treatment of each stage in the important formations on a geographical basis, attempting in each case to give an approximate map of the distribution of land and water at the time. No geological work was illustrated so richly with sketch-maps before. These paleogeographical considerations are here applied on a world-wide scale throughout the whole range of geological time, and furnish an instructive and almost bewildering insight into the frequency and variety of the interchanges which have taken place between land and water. Prof. de Lapparent is careful to guard against the impression that these sketches are intended to delineate the detail of fossil coast-lines; he clearly states that they are of a purely general character, showing merely the relative positions of the larger stretches of land and water. How completely the geographical rather than the biological idea dominates this new exposition of geology may be gathered from the statement in the preface: "In adopting this point of view henceforth, it is our aim to allow geology to emerge from its traditional dryness, and to present it no longer as a juxtaposition of isolated sections from which one endeavours to extract the elements of a history of life on the surface of the globe, but rather as a reconstruction of the successive episodes which are presented by the geographical evolution of the planet as a whole." No author has done more than M. de Lapparent to urge on geologists the value of geographical conceptions, and on geographers the fundamental importance of geological facts.

**The Dutch Deep-Sea Expedition in the Malay Archipelago.**—The latest accounts of the progress of this expedition (*Journal*, vol. xiii. p. 57), given in outline from Prof. Weber's reports in the last two numbers of *Petermanns Mitteilungen* for 1899 (pp. 272, 298), and in the first number of the *Geographische Zeitschrift* for 1890, show that most valuable results have already been obtained. The operations have included, in addition to the zoological investigations, soundings,

* 'Traité de Géologie,' par A. de Lapparent, membre de l'Institute. Quatrième édition, refondue et considérablement augmentée. En deux parties—Phénomènes Actuel, et Géologie proprement dite. Paris: Masson et Cie., 1900.

determinations of temperature, etc., extensive surveys of the coasts and harbours where existing maps have proved defective. The sea-areas examined include the Macassar strait, Celebes sea, Molucca strait, Halmahera sea, and Ceram sea, while many of the adjoining coasts and islands have been touched at. The deep-sea soundings have given unexpected results, which entirely modify our ideas as to the configuration of many parts of the sea-floor. The examination of the sea north of Bali and Lombok disclosed the fact that no continuous deep channel, such as was taken by Wallace as the prime factor of the distribution of animals in this part of the world, exists between the islands, the deep water being closed in towards the south of the strait by a submarine ridge with no depth greater than 170 fathoms. Again, although a submarine ridge running across the Manipa strait divides the Banda sea from that of Ceram, no such connecting ridge runs between Buru and the Sula-Besi group, nor between Buru and Celebes, depths of 2200 and 2674 fathoms being found on the two lines in question. The Ceram sea is, however, separated from the Molucca strait by a submarine ridge.

## GENERAL.

**The Russian Geographical Society.**—The Russian Geographical Society held its annual meeting on February 7, and at this meeting Admiral Rykatcheff, well known for his extensive meteorological work, was elected Vice-President of the Society, to occupy the vacancy left by the death of General Tillo. The following medals were awarded:—The great Constantine gold medal went this year to the section of ethnography, and was awarded to A. M. Pozdyéeff for his great work, 'Mongolia and the Mongols,' and his other works, 'The Monasteries of Mongolia,' etc., devoted to the study of that country; the gold medal of Count Lütke to L. K. Artamonoff for his geodetic work in Caucasia, Persia, and Abyssinia; the gold medal of P. P. Semenoff to E. W. Bretschneider for his extensive work, written in English, 'History of European Botanical Discoveries in China.' The great gold medal of the Geographical Society, which had to be awarded this year in the section of ethnography, was given to N. A. Marruza for his 'Collection of the Parables of Wordan;' and finally, the gold medal of Przevialsky was awarded to E. E. Anert for his work on the geology of Manchuria. Small gold medals were awarded to R. N. Savélieff for work in meteorology which he had done for the Society; to N. N. Lelyakin for numerous astronomical determinations and other similar work; and to V. N. Iochelson for his paper on the nomad-stems in the boundaries between the Indighirka and the Kolyma. The silver medal of P. P. Semenoff was awarded to Madame M. A. Lyamina for her popularization of the works accomplished by Russian travellers; while eleven silver medals of the Society were given to A. K. Bulatovich, V. Th. Novitzky, P. G. Ignatieff, and K. P. Mordvin for work done in the section of mathematical and physical geography; and to V. G. Bogoraz (the explorer of Yakutsk), G. G. Iliinsky, P. Dvinovsky, G. Skurlatoff, G. Wilczinski, and Madame E. E. Lineff for work done in connection with the section of ethnography. Five bronze medals were awarded by the physical geography section to MM. Lukianoff and Seid Sivachi (in Bukhara), and to three students of the Kieff Polytechnical School, MM. Kozlennikoff, Malevansky, and Savélieff.

**New Publication of the Paris Geographical Society.**—Following the precedent of the Royal Geographical Society in 1879, the Paris Geographical Society has from the beginning of 1900 abandoned the dual system of publication which has for so long been the tradition of learned societies. In place of the *Comptes Rendus*, or Proceedings, and the *Bulletin*, or Transactions, formerly published, the Society now produces a handsome monthly journal, including original papers read to the Society, notes and bibliography under the title "La Géographie,

Bulletin de la Société de Géographie." The January number contained eighty and the February number ninety-six of the largest octavo pages, accompanied by maps and plates. The new publication is edited by Baron Hulot, the general secretary of the Society, and M. Charles Rabot, editorial secretary. We congratulate the Society on the handsome appearance of its new journal, and wish it all success.

## OBITUARY.

### The Marquis of Lothian, K.T.

Schomberg Henry Kerr, ninth Marquis of Lothian, whose death occurred in January, after an illness of three months, had been a member of our Society since 1864. Lord Lothian formerly held various appointments in the Diplomatic Service, the last being in Vienna, where he was appointed second secretary in 1865. He succeeded to the title in 1870, and was Secretary for Scotland in Lord Salisbury's second administration from 1887 to 1892. Lord Lothian's taste for geography was no doubt stimulated by his service abroad, during which Persia had been included in his sphere of activity. He had in recent years been President of the Royal Scottish Geographical Society.

### Sir William Wilson Hunter, K.C.S.I., C.I.E.

We regret to record the death, in his sixtieth year, of Sir William W. Hunter, the well-known authority on Indian history and statistics, which took place on February 7, as the result of an attack of influenza. The son of a Glasgow manufacturer, William Hunter was educated in that city, graduating at the University at the age of twenty. After completing his studies at Paris and Bonn, he took a high place in the Indian Civil Service competition in 1861, and was appointed to a post at Birbhum, in southern Bengal. Here he devoted much time to the study of local tradition and history under British rule, publishing the results in 1868, under the title of 'Annals of Rural Bengal.' By this work, and a second published in 1872, on the province of Orissa, Hunter's literary qualifications became generally recognized, and in 1869 he was entrusted by Lord Mayo with the important task of superintending the collection and publication of statistical accounts of all the Indian provinces, regarding the true state of which great ignorance had prevailed, not only in England, but even among those in authority in India. This work occupied twelve years, during which Hunter travelled from end to end of the country, and thus gained a personal insight into its varying characteristics such as falls to the lot of few. The results were published in over 100 volumes, the substance of which was afterwards condensed and re-arranged so as to form the well-known 'Gazetteer of India,' originally issued in nine, but subsequently enlarged to fourteen volumes. Incidentally, a useful service was done in the publication of the 'Gazetteer,' by the systematization of the orthography of Indian place-names, for which Hunter's method has been generally accepted. After the conclusion of the work, during the progress of which he had held the post of Director-General of Statistics, Hunter was for some years a member of the Governor-General's council, but retired in 1887, settling down near Oxford to a life of literary activity. Among the varied productions of his pen, his 'Life of Brian Hodgson' (1896), and the opening volume of a great work on the 'History of British India,' published last year, may be specially mentioned. The latter was to have been the first of five volumes, in which the great mass of materials collected by Hunter during his life in India

were to be drawn upon for a comprehensive account of the growth of British dominions in that country. Sir William Hunter was married in 1863 to a daughter of Thomas Murray of Edinburgh, who, with two sons, survives him. Sir William Hunter had been a Fellow of the Society since 1872.

## Sir Henry William Gore-Booth, Bart.

The death has lately occurred of Sir Henry Gore-Booth, Deputy-lieutenant and Justice of the Peace for the County of Sligo, who had been a Fellow of our Society since 1879. Sir Henry, who succeeded his father as Baronet in 1876, was known to geographers for the cruise in the Arctic seas which he undertook in 1879, hiring for the purpose the Norwegian cutter *Isbjorn*, the vessel in which Payer and Weyprecht had made their preliminary voyage to the north in 1871. He was accompanied by Captain (now Admiral) A. H. Markham, who subsequently published an account of the cruise, which he also described in a paper read before our Society (*Proceedings*, N.S., vol. ii. pp. 1 *et seq.*). Although great results were not attained, the voyage was useful as throwing light on the state of the ice at the time in the seas between Novaya Zemlya and Spitzbergen. Sir Henry Gore-Booth succumbed to an attack of influenza at St. Moritz on January 13 last.

## M. Henri Coudreau.

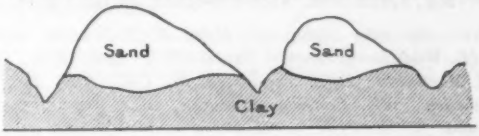
The death has been announced of M. Henri Coudreau, the well-known explorer of French Guiana and neighbouring parts of Brazil, who succumbed to a severe attack of fever while engaged in an expedition on the Trombetas, a northern tributary of the Lower Amazon. M. Coudreau's exploring activity had been maintained with little intermission for nearly twenty years, and the results as regards our knowledge of the interior of Guiana have been of much value. In 1881 he obtained from the French Government a mission for the examination of the geography and resources of the French territory, the execution of which occupied him until 1885. The districts visited included that of the Galibi tribe in the northern part of the colony, the contested territory between the Oyapok and the Araguari, and the more remote region of the Rios Branco and Negro. The results of the journeys were published in 1886–7 under the title of 'La France Equinoxiale,' a work which deals, in addition to the narrative of the journeys, with a wide range of subjects from the native Indian tribes to the history and prospects of colonization, the latter being regarded by the author as bright. Between 1887 and 1891 M. Coudreau continued his labours in the southern interior of French Guiana, exploring the courses of the Maroni, Itani, Oyapok, and other rivers, and determining the altitudes of a number of points in the Tumuc Humac range, the climate of which he found healthy and exhilarating. In the upper basin of the Oyapok, which he found almost uninhabited, he surveyed a large area of previously quite unexplored country, while he also crossed to the southern slopes of the Tumuc Humac range. He described these journeys in a work entitled, 'Chez nos Indiens' (1893), while their cartographical and other results were dealt with also in the *Bulletin* of the Paris Geographical Society. In 1896 he turned his attention to Brazil, making a voyage up the Tocantins, and in the following year undertaking, on behalf of the Government of the State of Para, an examination of the Xingu and its tributaries. In this he encountered considerable difficulties, both from the rapids and from the hostility of the natives. In 1898 he made an important journey between the Tocantins and Xingu, the results of which were recorded in a work published last year, including a large-

scale map in fifteen sheets. The most important rectification introduced was that of the course of the Anapu, the principal stream of the region south of Marajo island, till then practically a *terra incognita*. Of M. Coudreau's last disastrous journey little is yet known.

## CORRESPONDENCE.

### The Regions of the Okovango.

The headwaters of the Okovango and Kwando or Chobé rivers drain a country of sand-hills. These sand-hills rest on an extensive bed of clay; the river-channels have cut through this clay bed long ago, so that the outcrop of clay is on the hill-side and often above the path. Towards the end of the rainy season the water trickles out all along these clay-seams and runs down to the rivers; and as the dry season advances this trickle increases to quite a flow in some places. As an ordinary untrained observer, the theory has suggested itself to me that the weight of the heaped-up sand has caused depressions in the clay bed, corresponding in a rough way to the height of the heap of sand drifted by the wind on top (for the sand-hills run roughly north and south, and their gradual slopes all face to the east, which is the direction of the prevailing winds in that part of Africa), thus:




If this be so, then it is easy to see how, when the depressions in the clay fill up, the water will overflow, and finally be drained off by innumerable syphons into the river-beds. The smaller rivers and streams all flow rapid and clear as crystal.

Fred. S. Arnot.

53, Belmont Drive, Liverpool, February 1, 1900.

### Lake Rukwa.

That Lieut. Glanning (*Geographical Journal*, vol. xv. p. 179) should make the length of the open water of Lake Rukwa to be over 50 miles—more than double what I found it—is interesting, because he was there in June, two months earlier in the year than I was, and the length of 50 miles is just midway between the limits I assigned to the lake in the wet and dry seasons—80 miles at the end of the wet season, say, in March, and 25 miles in the month of August, when I was there—and is, therefore, in substantial agreement with my observations. That he should have thought, however, that the lake does not considerably increase its dimensions in the rainy season, is probably due to the fact that the water was high when he was there, and that his expedition passed from Muambunyu's (Mwini Wungu's) round the east and south of the lake, where it alters least to Kasonso's on the Saisi. On the portion between Chiubi and Chipindi on this route, it can hardly alter at all unless the water falls very low, for the sides are here often precipitous. On the south, where he supposes the lake to have retreated a mile within the last ten years, is the plain which I considered to be covered with water in the rainy season. It is more than probable that this plain is not covered every rainy season, and that the full length of 80 miles is not all open water every year, but that the lake considerably alters its dimensions is evident from the fact that it was

25 miles longer when the German expedition was there last year than when I was there in 1897, and the whole of the increase must be on the portion which I have shown as swamp to the north-west. Beyond this swamp is the bare part, which is flooded from the river Kafu, and which in June was probably already dried up, as it was when I crossed it in August.

As the German Government have now taken in hand more accurate surveys of this part of the country, probably any speculations as to the changes in volume of the lake are useless, for these changes will certainly be very carefully noted and before long made known, and then I think it will be found that, at least during many, if not all rainy seasons, the full extent of 80 miles will be covered by water, which, in the dry season, will contract to only 25 miles, as it had done when I was there.

L. A. WALLACE.

## MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1899-1900.

*Fourth Ordinary Meeting, January* 22, 1900.—Colonel Sir T. H. HOLDICH, R.E., K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*Alexander Alexander; Hubert E. M. Bourke; Captain Cowper, 2nd Queen's (R. West Surrey Regt.); Captain H. J. Hare, R.E.; Dr. Guy Mottram; Basil Martineau; E. S. Preston, M.A., C.E., A.M. Inst. C.E.; Cecil Poulett-Weatherley; Wm. Scoresby Routledge, M.A. Oxon.; Godfrey Herbert Joseph Williams.*

The Paper read was:—

"An Expedition to the Summit of Mount Kenya, British East Africa." By H. J. Mackinder, M.A.

*Fifth Ordinary Meeting, February* 5, 1900.—General Sir CHARLES W. WILSON, R.E., K.C.B., K.C.M.G., Vice-President, in the Chair.

ELECTIONS.—*James F. J. Archibald; William Boyd; Frank R. Cana; Arthur Higgs Cane; William Morris Colles, B.A. (Cambs.); Albert Crailsheim; William Christian Daish, M.D.; Gilbert Davidson; Francis George Didden; Maurice Egerton; Percy Norman Furber; Robert Norrell Greenwood; C. B. Hausberg; Clarence Hooper; Alexander Howell; Captain William Frederick O'Connor, R.A.; George Sandeman; James White.*

The Paper read was:—

"A Fragment of the Geography of England: South-West Sussex." By Dr. H. R. Mill.

## GEOGRAPHICAL LITERATURE OF THE MONTH.

### *Additions to the Library.*

**By HUGH ROBERT MILL, D.Sc., *Librarian*, R.G.S.**

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

**A selection of the works in this list will be noticed elsewhere in the "Journal."**

## EUROPE.

**Austria—Bohemia.** *Sitzb. A.W. Wien* **107**, Abth. 1 (1898): 669–698. **Knett.**
Mittheilungen der Erdbeben-Commission der Kaiserlichen Akademie der Wissenschaften in Wien. VII. Verhalten der Karlsbader Thermen während des vogtländisch-westböhmischen Erdbebens im October–November 1897. Von Josef Knett. *With Map, Diagrams, and Plates.*

**Austria—Bohemia.** *Sitzb. A.W. Wien* **107**, Abth. 1 (1898): 1179–1207. **Woldřich.**
Mittheilungen der Erdbeben-Commission der Kaiserlichen Akademie der Wissenschaften in Wien. IX. Bericht über die unterirdische Detonation von Melnik in Böhmen vom 8 April 1898. Von J. N. Woldřich. *With Map.*

**Austria—Bohemia.** *Sitzb. A.W. Wien* **107**, Abth. 1 (1898): 789–959. **Becke.**
Mittheilungen der Erdbeben-Commission der Kaiserlichen Akademie der Wissenschaften in Wien. VIII. Bericht über das Graslitzer Erdbeben, 24 October bis 25 November 1897. Von F. Becke. *With Maps.*

**Belgium.** *Mém. Cour. A.R. Belgique* **48**, 2 (1898): 1–156. **Kurth.**
La frontière linguistique en Belgique et dans le nord de la France. Par G. Kurth.

**Central Italy.** **Baedeker.**
Italy. Handbook for Travellers. By K. Baedeker. Second Part: Central Italy and Rome. Thirteenth Revised Edition. Leipsic: Karl Baedeker; London: Dulau & Co., 1900. Size 6½ × 4½, pp. lxxvi. and 454. *Maps, Plans, etc. Price* 7 *m.* 50 *pf. Presented by Messrs. Dulau & Co.*

**France—Vaucluse.** *B.S.G. Marseille* **23** (1899): 31–51, 161–176. **Barrême.**
La géographie du Mont-Ventoux. Par M. Eug. Barrême.

**Germany.** **Schwabach.**
Trade of Germany for the year 1898. Foreign Office, Annual No. 2344, 1899. Size 10 × 6, pp. 44. *Price* 2½*d.*

**Germany—Bavaria.** **Gruber.**
Das Ries. Eine geographisch-volkswirtschaftliche Studie. Von Dr. Christian Gruber.—Forschungen zur deutschen Landes- und Volkskunde . . . herausgegeben von Dr. A. Kirchhoff. Zwölfter Band, Heft 3. Stuttgart: J. Engelhorn 1899. Size 9½ × 6½, pp. 187–292. *Maps and Diagrams.*

A geographical monograph of the small agricultural district known as the Ries, between the Swabian and Franconian Jura, bordering on Württemberg.

**Germany—Hamburg.** *M.G. Ges. Hamburg* **15** (1899): 131–188. **Buchheister.**
Die Elbe und der Hafen von Hamburg. Von M. Buchheister. *With Plan.*
*Also a separate copy presented by the Hamburg Geographical Society.*

This memoir deals with the Elbe as a river, but mainly with the lower Elbe, its improvement and lighting, the formation and growth of the harbours of Hamburg and Cuxhaven, and the trade of these ports.

**Germany—Prussia.** **Bernal.**
Trade of Stettin and District for the year 1898. Foreign Office, Annual No. 2345, 1899. Size 10 × 6, pp. 50. *Price* 3*d.*

**Greece—Archæology.** **Komninoi.**

Panagiotoi Al. Komninoi. Lakonika Chronon proïstorikon te kai istorikon. Chorographia Lakonikes kai topographia Spartes istorike. Athenais: Typographeion "Paliggenesias," 1898. Size 9½ × 6½, pp. 368. *Presented by the Author.*

**Holland—Springs.** *Verh. K.A. Wetens. Amsterdam* (2 de Sec.) **6** (1899): 1–40. **Lorié.**

Mededeelingen omtrent de geologie van Nederland, verzameld door de commissie voor het geologisch onderzoek. No. 26. Onze brakke, ijzerhoudende en alkalische Bodemwateren. Door Dr. J. Lorié. *With Plate.*

On the saline water of some springs and wells in Holland, with a discussion of its origin.

**Hungary—Carpathians.** *C. Rd.* **129** (1899): 978–980. **Martonne.**

Sur l'histoire de la vallée du Jiu (Karpates méridionales). Note de M. E. de Martonne.

The valley of the Jiu is peculiar in being a transverse valley cutting through a whole chain of mountains.

**Italy—Alps.** *B.S.G. Italiana* **12** (1899): 572–585. **Davis.**

Balze per faglia sui Monti Lepini, nota del prof. William M. Davis, tradotta dal socio dott. Fr. M. Pasanisi. *With Map and Illustrations.*

**Italy—Lipari Islands.** *Abh. A.W. München* **20** (1899): 1–274. **Bergeat.**

Die äolischen Inseln (Stromboli, Panaria, Salina, Lipari, Vulcano, Filicudi und Alicudi) geologisch beschrieben. Von Alfred Bergeat. *With Maps and Plates.*

A study of volcanic geology, illustrated by coloured geological maps of the islands mentioned above, by numerous sketches and diagrams, and accompanied by exhaustive bibliographies.

**Mediterranean—Cyprus.** *J.R.I. British Architects* **7** (1899): 21–35. **Murray.**

Excavations in Cyprus, 1896. By Dr. A. S. Murray. *With Illustrations.*

On the archæological results of the excavations at Salamis.

**Norway—Hardanger Lakes.** *Geolog. Mag.* **6** (1899): 533–540. **Monckton.**

Notes on some Hardanger Lakes. By H. W. Monckton. *With Illustrations.*

**Russia.** **Michell.**

Trade of Russia for the Year 1898. Foreign Office, Annual No. 2343, 1899. Size 10 × 6, pp. 90. *Price 5d.*

**Russia.** **Woodhouse.**

Trade of Riga and District for the Year 1898. Foreign Office, Annual No. 2342, 1899. Size 10 × 6, pp. 26. *Price 2d.*

**Southern Europe.** *C. Rd.* **129** (1899): 734–737. **Matteucci.**

Sur l'état actuel des volcans de l'Europe méridionale. Note de M. Matteucci.

**Sweden—Timber Industry.** **Lundström.**

Från Svenska Barrskogar. Förklaringar och Bilder till Sågverks- och Trävaruexportföreningens utställning i Stockholm, 1897, utgifna af Axel N. Lundström. Stockholm, 1897. Size 9 × 6½, pp. 52. *Illustrations. Presented by the K. Universitets-Biblioteket, Upsala.*

A richly illustrated account of the pine-forests of Sweden and the trade in preparing and manufacturing timber in that country. There are ninety-two pages of excellent illustrations.

**Turkey.** *Verh. Ges. Erdk. Berlin* **26** (1899): 305–319. **Oestreich.**

Reisen im Vilajet Kosovo. Von Dr. Karl Oestreich.

**United Kingdom—Ireland.** *P.R. Irish A.* **5** (1899): 433–440. **Knowles and others.**

Investigation of the Prehistoric Settlements near Roundstone, Connemara. Report of the Committee, consisting of Messrs. W. J. Knowles, W. H. Paterson, R. L. Praeger, and F. J. Bigger. *With Illustrations.*

**United Kingdom—Minerals.** **Foster.**

Mines and Quarries: General Report and Statistics for 1898. Part iii.—Output. General Report and Statistics relating to the Output and Value of the Minerals raised in the United Kingdom, the Amount and Value of the Metals produced, and the Exports and Imports of Minerals. Edited by C. Le Neve Foster, D.Sc. London: Eyre & Spottiswoode, 1899. Size 13 × 8½, pp. 117–266. *Diagram. Price 1s. 5d. Presented by the Home Office.*

## ASIA.

**Arabia.** **Bent.**
Southern Arabia. By Theodore Bent and Mrs. Theodore Bent. London: Smith, Elder & Co., 1900. Size 9 × 6, pp. x. and 456. *Portrait, Maps, and Illustrations. Price* 18*s*. *Presented by the Publishers.*

This recounts the various journeys made by the late Mr. Theodore Bent and by Mrs. Bent in Southern Arabia, and is accompanied by detailed maps, photographs, and copies of inscriptions.

**Cambodia—Rice Culture.** *Rev. Scientifique* **13** (1900): 109–114. **Leclère.**
La culture du riz au Cambodge. Par M. Adhémard Leclère.

**China, etc.** *J. Linnean S.* (*Botany*) **26** (1899): 457–538. **Forbes and Hemsley.**
An Enumeration of all the Plants known from China Proper, Formosa, Hainan, Corea, the Luchu Archipelago, and the Island of Hongkong, together with their Distribution and Synonymy. By F. B. Forbes and W. B. Hemsley.

**China—Boats.** **Cholnoky.**
Közlekedés a Rhinai alföldon. Cholnoky Jenö-töl. (Különlenyomat a Magyar Mérnök- és Épitész-Egylet Közlönye 1899, évi v. füzetébol.) Size 12½ × 9½, pp. 14. *Map and Illustrations. Presented by the Author.*

On Chinese river-boats, with many illustrations of the vessels and their equipment.

**China—Bridges.** **Cholnoky.**
A Rhinaiak hídépitéséröl. Cholnoky Jenö-töl. (Különlenyomat a Magyar Mérnök- és Epitész-Egylet Közlönyének 1899, évfolyamából.) Size 12½ × 9½, pp. 12. *Illustrations. Presented by the Author.*

On Chinese bridges, with numerous illustrations of different types of bridges in China.

**China—Mongolia.** **Suess.**
Ueberreste von Rhinoceros sp. aus der östlichen Mongolei. Von Akadem. Ed. Suess. Mit Anmerkungen von W. Obrutschew. (Separat-Abdruck aus den Verhandlungen der Kaiserlichen Russischen Mineralogischen Gesellschaft zu St. Petersburg. Zweite Serie, Band xxxvi. No. 2.) St. Petersburg: C. Birkenfeld 1899. Size 9½ × 6½, pp. [10]. *Illustrations. Presented by M. W. Obrutschew.*

**China—Wuhu.** **Clennell.**
Trade of Wuhu for the year 1898. Foreign Office, Annual No. 2340, 1899. Size 9½ × 6, pp. 16. *Price* 1*d*.

**Indo-China.** *B.S.G. Paris* **20** (1899): 330–343. **Barthélemy.**
Au pays des Moïs. Par le Comte de Barthélemy. *With Map.*

**Japan.** *T. Asiatic S. Japan* **26** (1898): 1–114, 163–218. **Riess.**
History of the English Factory at Hirado (1613–1622). With an Introductory Chapter on the Origin of English Enterprise in the Far East. By Dr. Ludwig Riess.

**Malay Archipelago—Amboina.** **Verbeek.**
*Verh. K.A. Wetens. Amsterdam* **6**, 2 Sec. (1899): 1–26.

Over de Geologie van Ambon. Door R. D. M. Verbeek. *With Plate.*

**Malay Archipelago—British North Borneo.** **Cook**
Trade of British North Borneo for the Year 1898. Foreign Office, Annual No. 2347, 1899. Size 10 × 6, pp. 20. *Price* 1½*d*.

**Malay Peninsula.** **St. John.**
Takkola. By R. F. St. Andrew St. John. (From the *Proceedings* of the Oriental Congress at Paris.) Size 11 × 7, pp. [18]. *Presented by the Author.*

A critical study of the position of Takkola, a place mentioned in the Milinda Pañha, which has been localized as on the west coast of the Malay peninsula.

**Persia—Historical.** **Hotz.**
Perzië. Overzicht van in de Nederlandsche Taal uitgegeven werken, gevolgd door een Opgave van de voornaamste Buitenlandsche Schrijvers. Door A. Hotz. Leiden: E. J. Brill, 1897. Size 10 × 6½, pp. 48. *Presented by the Author.*

This gives details as to works in the Dutch language dealing with Persia, and references to books on Persia in other languages.

**Persia—Lake Urmi.** **Günther.**
Contributions to the Geography of Lake Urmi and its Neighbourhood. By R. T. Günther, M.A. (From the *Geographical Journal* for November, 1899.) Size 10 × 6½, pp. 20. *Map and Illustrations.*

**Persian Gulf.** **Meade.**
Trade of Persian Gulf for the Year 1898. Foreign Office, Annual No. 2346, 1899. Size 10 × 6½, pp. 46. *Price* 2½*d.*

**Russia—Siberia.** *B.A. Imp. Sci. St.-Pétersbourg* **10** (1899): 269–318. **Bogoraz.**
Spécimens des matériaux pour l'étude de la langue des Tchouktches et du folk-lore, recueillis dans le district de Kolymsk. Par V. Bogoraz. [In Russian.]

**Russian Central Asia.** *Oester. Monats. Orient.* **25** (1899): 85–88. ——
Das Eisenbahnwesen in Centralasien und seine Bedeutung.
On the importance of the Russian railways in opening up Central Asia.

**Tian Shan.** *Z. Ges. Erdk. Berlin* **34** (1899): 1–62, 193–271. **Friederichsen.**
Morphologie des Tiën-Schan. Von Dr. Max Friederichsen. *With Map.*
*Also a separate copy presented by the Author.*

**Tibet.** *B.S.G. Genève* **38** (1899): 122–141. **Turrettini.**
Voyage et aventures de M. et M^me^ Rijnhart, médecins-missionnaires, dans le Thibet oriental. Par M. François Turrettini.

**Turkey.** *Deutsche Kolonialzeitung* **16** (1899): 514. **Wyneken.**
Die deutsche Bagdadbahn. Von Dr. W. Wyneken. *With Map.*
Showing the route of the Asia Minor and Bagdad lines, for which the German Railway Company has obtained a concession from the Sultan.

**Turkey—Armenia.** *M.G. Ges. Hamburg* **15** (1899): 1–23, 189–221. **Belck and Lehmann.**
Reisebriefe von der Armenischen Expedition. Von Dr. W. Belck and Dr. C. F. Lehmann.

**Turkey—Palestine and Syria.** *B.S.G. Paris* **20** (1899): 344–364. **Zumoffen.**
La météorologie de la Palestine et de la Syrie. Par le R. P. Zumoffen, S.J.

**Western China.** *T. Asiatic S. Japan* **26** (1898): v.–xxvii. **Fraser.**
Through Upper Burma and Western China. By John Foster Fraser.

## AFRICA.

**Abyssinia.** *Petermanns M.* **45** (1899): 243–244. ——
Der Bergrücken Kaiser Nikolaus II. *With Map.*
See vol. xiv. p. 663.

**Africa—Anthropology.** **Frobenius.**
*Abh. K. Leopoldin.-Carolin. Deutsch. A. Naturforscher* **74** (1899): 1–278.
Die Masken und Geheimbünde Afrikas. Von L. Frobenius. *With Illustrations.*

**Africa—Languages.** *Abh. Deutsch. Morgenländ. Ges.* **11** (1899): 1–245. **Meinhof.**
Grundriss einer Lautlehre der Bantusprachen nebst Anleitung zur Aufnahme von Bantusprachen. Anhang, Verzeichnis von Bantuwortstämmen. Von Carl Meinhof. *With Map.*
On the phonetic character of the Bantu speech, with a list of Bantu roots.

**Algeria.** *Ann. G.* **9** (1900): 43–55. **Busson.**
Les vallées de l'Aurès. Par M. H. Busson. *With Map and Illustrations.*

**British Central Africa.** **Caddick.**
A White Woman in Central Africa. By Helen Caddick. London: T. Fisher Unwin, 1900. Size 8 × 5½, pp. viii. and 242. *Illustrations. Price* 6*s. Presented by the Publisher.*
A record of a lady's experiences during a journey from Chinde at the mouth of the Zambesi to Lake Tanganyika and back, with observations on native life in British Central Africa.

**British Central Africa—Livingstonia Mission.** ——
The Livingstonia Mission of the Free Church of Scotland (British Central Africa). Report for 1898–99. Size 8½ × 5½, pp. iv. and 74. *Map and Illustrations.*

**British South Africa.** ——
The British South Africa Company. Directors' Report and Accounts, 1897–98. [7.] Size 10½ × 8½, pp. 44. *Maps. Presented by the British South Africa Company.*

**Congo State.** *Mouvement G.* **16** (1899): 625–636. ——
Compagnie du Congo pour le Commerce et l'Industrie. Assemblée générale ordinaire du 18 décembre 1899. *With Map.*

**Congo State.** *B.S.G. Roman*ă **20** (1899): 65–74. **Lévy.**
Une population congolaise: Les Mangbettu. Mœurs et Coutumes. La Belgique et le Congo. L'avenir du Congo. Par Victor Lévy.

**East Africa.** *Mouvement G.* **16** (1899): 493–495. ——
La rivière Omo et le lac Rodolphe.

**East Africa.** **Radford.**
[Journey up the Juba. By Dr. W. J. Radford.] 1899. Size 13½ × 8½, pp. 8. *Presented by the Foreign Office.*
This journey is described in the *Journal* for December, 1899, vol. xiv. p. 637.

**Egypt.** **Bénédite.**
Collection des Guides-Joanne. Égypte. [In three Parts.] Paris: Hachette et Cie, 1900 [1899]. Size 6½ × 4½, pp. lii., 630, and 24. *Maps, Plans, and Illustrations. Price* 20 *fr.*
This guide-book is conveniently bound in three thin volumes.

**Egypt—Siwa.** *Z. Ges. Erdk. Berlin* **34** (1899): 271–280. **Grünau.**
Bericht über meine Reise nach Siwah. Von Leutnant Freiherr von Grünau.

**Egyptian Sudan.** *Mouvement G.* **16** (1899): 565–566. ——
Le Bahr-el-Gazal. *With Map.*

**Egyptian Sudan.** *B.S.R.G. d'Anvers* **23** (1899): 149–223. **Collin.**
La Question du Haut-Nile et le point de vue Belge. Par M. V. Collin. *With Map.*
On the relation of the Congo State to the upper Nile.

**French Sudan.** *B.S.G. Paris* **20** (1899): 304–307. **Guy**
Mission Bonnel de Mézières. Par Camille Guy.
Plans of the commercial expedition from the Ubangi towards Bahr-el-Ghazal, and returning *viâ* Lake Chad in order to explore the hitherto untraversed parts of the French Sudan.

**French West Africa.** *B.S.G. Paris* **20** (1899): 279–284. **Chanoine.**
Mission Voulet-Chanoine. Par M. le Capitaine Chanoine.

**Gambia.** **Llewelyn.**
Gambia. Annual Report for 1898. Colonial Reports—Annual, No. 264. 1899. Size 9½ × 6, pp. 16. *Price* 1*d.*

**German East Africa—Kilimanjaro.** **Chanel.**
*Tour du Monde* **5** (1899): 385, 397, 409, 421, 433.
Voyage au Kilima Ndjaro. Par M. Joseph Chanel. *With Map and Illustrations.*

**German East Africa.** *Petermanns M.* **45** (1899): 225–228. **Langhans.**
Mgr. Lechaptois' Reisen auf der Ufipa-Hochfläche und im Rikwa-Graben. Mit Benutzung brieflicher Mitteilungen des P. Sigiez. Von Paul Langhans. *With Map.*

**German South-West Africa.** *Deutsche Kolonialzeitung* **16** (1899): 512–513. ——
Postverbindungen in Deutsch-Südwestafrika. *With Map.*
The railway from Swakopmund is in use up to Jackalswater, and the construction to Windhoek is proceeding.

**German West Africa—Togo.** **François.**
*Deutsche Kolonialzeitung* **16** (1899): 464, 474–475.
Die wirtschaftliche Lage im Togogebiet. Von Major A. D. C. von François. *With Map.*
The map shows the division of the neutral zone in West Africa, as desired by Germany and as expected by Great Britain.

**Gold Coast.** **Smith.**
Gold Coast, Annual Report for 1898. Colonial Reports, Annual No. 271, 1899. Size 9½ × 6, pp. 36. *Price* 2½*d.*
This report lays stress on the value of the resources of the colony, and urges the importance of a railway system, the beginnings of which now exist.

**Ivory Coast.** *B.S.G. Paris* **20** (1899): 249–278. **Clozel.**
La Côte d'Ivoire, notice historique. Par M. F. J. Clozel.

**Kamerun.** *Globus* **76** (1899): 284–289, 303–309. **Hutter.**
Politische und Sociale Verhältnisse bei den Graslandstämmen Nordkameruns. Von Hauptmann Hutter. *With Illustrations.*

**Mauritius and Rodrigues.** **Bower.**

Mauritius and Rodrigues. Reports for 1898. Colonial Reports, Annual No. 279, 1899. Size 9½ × 6, pp. 52. *Diagram.* *Price* 4*d.*

**Natal—Mining Industry.** **Gray.**

Report on the Mining Industry of Natal for the year 1898. By C. J. Gray. Pietermaritzburg: P. Davis & Sons, 1899. Size 13 × 8½, pp. 48. *Diagrams and Sections.* *Presented by Mr. C. J. Gray, Commissioner of Mines, Natal.*

**Nigeria.** **Bryan.**

Report on a Recruiting Expedition under Lieutenants H. Bryan and E. B. Macnaghten. [1899.] Size 13 × 8½, pp. 12.

**St. Helena.** **Sterndale.**

St. Helena. Report for 1898. Colonial Reports, Annual No. 265, 1899. Size 10 × 6, pp. 18. *Price* 1½*d.*

**Socotra.** *Geolog. Mag.* **6** (1899): 529–533. **Gregory.**

The Geology of Socotra and Abd-el-Kuri. By J. W. Gregory, D.Sc. *With Sketch-Map.*

This memoir is based in part on the geological collections made by Dr. H. O. Forbes and Mr. Ogilvie Grant.

**Transvaal.** ———

Further Correspondence relating to the Political Affairs of the South African Republic. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. viii. and 70. *Price* 8*d.*

This contains the official despatches from September 8 down to the date of the declaration of war on October 9, 1899.

**Uganda—Railway.** *Deutsches Kolonialblatt* **10** (1899): 632–635, 664–670. ———

Uganda-Eisenbahn. *With Map and Profile.*

**West Africa—Boundaries.** *Deutsche Kolonialzeitung* **16** (1899): 446–448. **Vohsen.**

Das Samoa-Abkommen und die Aufteilung der neutralen Zone im Togo-Hinterland. Von Konsul C. Vohsen. *With Map.*

**West Africa—Gando.** *Deutsche Kolonialzeitung* **16** (1899): 465–466. **Vohsen.**

Gando. Von Konsul Ernst Vohsen. *With Map.*

The map shows the route of Dr. Gruner from Ilo on the Niger to Gando.

## NORTH AMERICA.

**Alaska—Harriman Expedition.** *National G. Mag.* **10** (1889): 507–512. **Gannett.**

The Harriman Alaska Expedition. By Henry Gannett. *With Maps.*

**Canada.** **Baedeker.**

The Dominion of Canada with Newfoundland and an excursion to Alaska. Handbook for travellers. By Karl Baedeker. With 10 maps and 7 plans. Second revised edition. Leipsic: Karl Baedeker; London: Dulau & Co., 1900. Size 6½ × 4½, pp. lxii. and 268. *Price* 5 *m.* *Presented by Messrs. Dulau & Co.*

**Canada.** **Haldane.**

3800 Miles across Canada. By J. W. C. Haldane. London: Simpkin & Co., 1900. Size 7½ × 5, pp. xxiv. and 344. *Map and Illustrations.* *Presented by the Author.*

The aim of the author was to write what he hoped to be "one of the liveliest, breeziest, most enthusiastic, and most attractively instructive volumes on Canada ever written."

**Mexico.** **Biorklund.**

Federal District of Mexico. Foreign Office, Miscellaneous, No. 517, 1899. Size 9½ × 9, pp. 36. *Price* 2½*d.*

**Mexico.** **Biorklund.**

Trade of Mexico for the Year 1898. Foreign Office, Annual No. 2336, 1899. Size 9½ × 6, pp. 42. *Price* 2½*d.*

In the beginning of the century there were more than a score of British commercial firms in the city of Mexico, but now there is not one, although several houses are represented by agents. Hints are given how to prevent the steady loss of British trade with the republic.

**Newfoundland.** *J.R. United Service I.* **43** (1899): 1177–1201. **Dashwood.**
The French in Newfoundland. By Major-General R. L. Dashwood.

**United States—Alaska.** **Klotz.**
Notes on Glaciers of South-Eastern Alaska and adjoining Territory. By Otto J. Klotz. (From the *Geographical Journal* for November, 1899.) Size 10 × 6½, pp. 12. *Maps and Illustrations.*

**United States—Nebraska.** *Science* **10** (1899): 768–770. **Bessey.**
Are the Trees Advancing or Retreating upon the Nebraska Plains? By Prof. Charles E. Bessey.

**United States—New Orleans.** **Slack.**
Battle of New Orleans, 8th January, 1815. By Captain Charles Slack. London: 1899. Size 4½ × 3, pp. 16. *Presented by the Author.*

**United States—New York.** *B. American G.S.* **31** (1899): 315–343. **Tarr.**
Physical Geography of New York State. By Ralph S. Tarr. Part viii. Niagara. *With Maps and Illustrations.*

**United States—San Francisco.** **Pickersgill.**
Trade of San Francisco and District for the Year 1898. Foreign Office, Annual No. 2349, 1899. Size 10 × 6, pp. 38. *Price* 2½*d.*

The consul repeats the usual caution that British subjects wishing to settle should refrain from purchasing land or embarking in fruit farming on their own account until they have had one or two years' experience of the country.

**United States—Weather.** *American J. Sci.* **8** (1899): 319–338. **Fassig.**
Types of March Weather in the United States. By O. L. Fassig. *With Diagrams.*

## CENTRAL AND SOUTH AMERICA.

**Argentina—Toba language.** *Rev. Museo La Plata* **9** (1899): 253–332. **Lafone-Quevedo.**
Vocabulario Toba-Castellano-Ingles, fundado en el vocabulario y arte del Padre A. Bárcena, con equivalencias del indio Lopez, en 1888, arreglado por Samuel A. Lafone-Quevedo, M.A.

A vocabulary of the Toba language, with equivalents in Spanish and English.

**Argentine Republic.** ———
Boletin Demográfico Argentino. Publicación de la oficinia Demográfica Nacional Ministerio del Interior, Año I. Agosto de 1899. Número I. Buenos Aires, 1899. Size 14½ × 10½, pp. 40. *Maps and Diagrams.*

**Argentine Republic.** *Rev. Museo La Plata* **9** (1899): 141–196. **Roth.**
Reconocimiento de la Region Andina de la República Argentina Apuntes sobre la geologia y la paleontología de los Territorios del Rio Negro y Neuquen (Diciembre de 1895 á Junio de 1896). Por Santiago Roth. *With Map and Plates.*

**Bahamas.** **Churchill.**
Bahamas. Report for 1898. Colonial Reports, Annual No. 277, 1899. Size 9½ × 6, pp. 52. *Price* 3*d.*

**Brazil.** ———
Matters of Commercial Intelligence relating to Brazil. Foreign Office, Miscellaneous, No. 510. 1899. Size 10 × 6, pp. 20. *Price* 1½*d.*

**Brazil.** **Rhind.**
Cotton Spinning and Weaving Industries in Brazil. Foreign Office, Miscellaneous, No. 511, 1899. Size 9½ × 6, pp. 8. *Price* ½*d.*

There were nine factories for the manufacture of cotton in Brazil in 1865, thirty in 1875, fifty-one in 1885, and no less than 134 in 1895. In 1899 there were 279,666 spindles and 9900 looms at work in the city and state of Rio de Janeiro. The quality of the Brazilian fibre makes it possible to produce the finest yarns in the country.

**Brazil.** **Lamberg.**
Brasilien, Land und Leute in ethischer, politischer und volkswirtschaftlicher Beziehung und Entwicklung. Erlebnisse, Studien und Erfahrungen während eines zwanzigjährigen Aufenthaltes von Moritz Lamberg. Leipzig: H. Zieger, 1899. Size 11½ × 7½, pp. viii. and 360. *Map and Illustrations.*

**Brazil.** *Deutsche Rundschau G.* **22** (1899): 103–110. **Nusser-Asport.**

Die Diamantenproduction in Brasilien. Von Chr. Nusser-Asport.

**British Guiana and Venezuela Boundary.** ———

Venezuela, No. 7 (1899). Boundary between the Colony of British Guiana and the United States of Venezuela. Award of the Tribunal of Arbitration constituted under Article I. of the Treaty of Arbitration signed at Washington on the 2nd February, 1897, between Great Britain and the United States of Venezuela. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 9. *Price* 1*d.*

**British Honduras.** **Newton.**

British Honduras. Report for 1898. Colonial Reports, Annual No. 278, 1899. Size 9½ × 6, pp. 32. *Price* 2*d.*

**Colombia.** **Hart.**

An American Railway in Colombia. By Francis R. Hart. Reprinted from *Technology Quarterly*, vol. xii., No. 2, June, 1899. Size 10½ × 7, pp. 123–134. *Maps and Illustrations. Presented by the Author.*

This paper deals specially with Cartagena and the railway thence to Calamar, on the Magdalena river, on which a service of steamers is carried on by the American company which owns the railway.

**Grenada.** **Drayton.**

Grenada. Report for 1898. Colonial Reports, Annual No. 280, 1899. Size 9½ × 6, pp. 32. *Price* 2*d.*

**Guatemala.** **Trayner.**

Trade, Agriculture and Finance of Guatemala for the year 1898. Foreign Office, Annual No. 2354, 1899. Size 9½ × 6, pp. 32. *Price* 2*d.*

**Leeward Islands.** **Melville.**

Leeward Islands. Annual Report for 1898. Colonial Reports, Annual No. 266, 1899. Size 10 × 6, pp. 40. *Price* 2½*d.*

**Paraguay.** *Rev. Museo La Plata* **9** (1899): 399–408. **Lehmann-Nitsche.**

Quelques observations nouvelles sur les Indiens guayaquis, du Paraguay. Par Robert Lehmann-Nitsche. *With Plate.*

**Patagonia.** *Globus* **76** (1899): 297–303. **Hauthal.**

Erforschung der Grypotherium-Höhle bei Ultima Esperanza. Ein Blick in die prähistorischen Zeiten Süd-Patagoniens. Von R. Hauthal. *With Illustrations.*

**St. Lucia.** **King-Harman.**

St. Lucia. Annual Report for 1898. Colonial Reports, Annual No. 267, 1899. Size 10 × 6½, pp. 38. *Price* 2½*d.*

**Turks and Caicos Islands.** **Cameron.**

Turks and Caicos Islands. Annual Report for 1898. Colonial Reports, Annual No. 269, 1899. Size 10 × 6½, pp. 22. *Price* 1½*d.*

## AUSTRALASIA AND PACIFIC ISLANDS.

**Australia—Handbook.** ———

The Australian Handbook (incorporating New Zealand, Fiji, and New Guinea), Shippers', Importers', and Professional Directory and Business Guide for 1900. London, etc.: Gordon & Gotch. Size 10 × 6½, pp. 672. *Maps, Plans, and Illustrations.*

**German New Guinea.** *M. Deutsch. Schutzgeb.* **12** (1899): 238-242. ———

Meteorologische Beobachtungen in Deutsch-Neu-Guinea.

**New Zealand—Year-Book.** **Dadelszen.**

The New Zealand Official Year-Book, 1899. (Eighth year of issue.) Prepared . . . by E. J. von Dadelszen, Registrar-General. Wellington, 1899. Size 8½ × 5½, pp. vi. and 702. *Map and Illustrations. Presented by the Registrar-General of New Zealand.*

Eleven new special articles are introduced into this edition.

**Queensland—Bibliography.** **Shirley.**

International Catalogue of Scientific Literature. Queensland Volume. By John Shirley, B.SC. Brisbane, 1899. Size 8½ × 6, pp. 154. *Presented by the Queensland Government.*

Stimulated by the proposals to form an international catalogue of scientific literature,

the Queensland Government has produced a classified catalogue of all scientific books and papers published in that colony.

**Samoa.**

Germany, No. 1 (1899). Despatch to Her Majesty's Chargé d'Affaires at Berlin, enclosing copies of the Convention and Declaration between Great Britain and Germany of November 14, 1899, for the Settlement of the Samoan and other questions. London: Eyre & Spottiswoode, 1899. Size 13¼ × 8½, pp. 6. *Price* 1*d*.

**Samoa.**

Samoa. No. 1 (1899). Correspondence respecting the Affairs of Samoa. Report of the Joint Commission. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 24. *Price* 3*d*.

**Samoa.** *Deutsche Kolonialzeitung* **16** (1899): 448–451. **Kusserow.**

Die Lösung der Samoafrage. Von H. von Kusserow. *With Maps.*

The maps show the division of the Solomon islands and of the Samoa group, and the harbour of Apia.

**Samoa.** *Blackwood's Mag.* **166** (1899): 847–851. **Thomson.**

The Samoa Agreement in Plain English. By Basil Thomson.

**Tasmania—Aborigines.** **Roth.**

The Aborigines of Tasmania. By H. Ling Roth, assisted by Marion E. Butler and Jas. Backhouse Walker, with a Chapter on the Osteology by J. G. Garson, M.D. Preface by Edward B. Tylor. Second Edition, Revised and Enlarged. Halifax: F. King & Sons, 1899. Size 10½ × 7½, pp. xx., 228, and civ. *Map and Illustrations. Price* 21*s*.

In this edition, Prof. Tylor points out in the preface, the new evidence as to the undoubted survival amongst the Tasmanians of representatives of the Palæolithic period is demonstrated, and further evidence brought forward to throw light on the anthropology of the extinct race.

## POLAR REGIONS.

**Antarctic Ship.**

Bedingungen für das Angebot auf den Bau eines Expeditionsschiffes für die geplante Südpolarerforschung. Berlin, 1899. Size 13 × 8½, pp. 12. *Plan.*

Details of the desiderata for an antarctic expedition ship.

**Franz Josef Land.** *National G. Mag.* **10** (1899): 481–505. **Wellman.**

The Wellman Polar Expedition. By Walter Wellman. *With Maps and Illustrations.*

**Franz Josef Land—Meteorology.** *National G. Mag.* **10** (1899): 512–516. **Baldwin.**

The Meteorological Observations of the Second Wellman Expedition. By Evelyn B. Baldwin.

**North-East Passage.**

The Story of the North-East Passage as told by the Early Explorers. (Nelson's Supplementary Readers, No. 1.) London: T. Nelson & Sons, 1899. Size 6½ × 4½, pp. 96. *Map and Illustrations. Price* 4*d*.

**Polar Regions.** **Shokalsky.**

J. de Schokalsky. Régions Polaires. (Extrait du dernier volume la Grande Encyclopédie Russe.) [In Russian.] Size 10 × 7, pp. 479–495. *Maps. Presented by the Author.*

**Polar Research.** *Verh. Ges. Erdk. Berlin* **26** (1898): 397–403. **Wrangell.**

Herr F. Baron von Wrangell. Mitteilungen über den Eisbrecher "Jermak."

**Spitsbergen.** *Q. J. Geolog. S.* **55** (1899): 681–691. **Garwood.**

Additional Notes on the Glacial Phenomena of Spitsbergen. By E. J. Garwood. *With Map and Plates.*

A study of the conditions of the inland ice of Spitsbergen.

## MATHEMATICAL GEOGRAPHY.

**Atmospheric Refraction.** **Matthiessen.**

*Abh. K. Leopold.-Carolin. Deutsch. A. Naturforscher* **74** (1899): 457–469.

Theorie der atmosphärischen Refraction und Totalreflexion der Schallwellen und ihre Bedeutung für die Nautik. Von Ludwig Matthiessen.

**Figure of the Earth.** *G.Z.* **6** (1900): 1–10 **Helmert.**
Neuere Fortschritte in der Erkenntnis der mathematischen Erdgestalt. Von F. R. Helmert.

**Figure of the Earth.** *Riv. G. Italiana* **6** (1899): 621–626. **Saija.**
Sulla ellissoidicità geodetica nella determinazione del rapporto della massa della Terra a quella del Sole. Nota di G. Saija.

**Longitude.** *Nautical Mag.* **68** (1899): 816–822. **White.**
Longitude by the Variation of the Compass. By J. Dundas White.
Historical notes recalling early attempts to find a ship's position by the variation of the compass.

**Navigation.** *Nautical Mag.* **68** (1899): 793–803. **Goodwin.**
Great Circle Sailing by Tables. By H. B. Goodwin, M.A.

**Surveying Instrument.** *Mém. S.G. Genève* **38** (1899): 1–14. **Ziegler**
Le Perspecteur, appareil inventé par M. Ch. von Ziegler. *With Illustrations.*

## PHYSICAL AND BIOLOGICAL GEOGRAPHY.

**Land Forms.** **Davis.**
The Drainage of Cuestas. By Prof. W. M. Davis. [Reprinted from the *Proceedings* of the Geologists' Association, vol. xvi., part 2, May, 1899.] Size 8¼ × 5½, pp. [20]. *Diagrams and Illustrations.*

**Land Forms.** **Marr.**
The Scientific Study of Scenery. By John E. Marr, F.R.S. London: Methuen & Co., 1900. Size 7½ × 5½, pp. x. and 368. *Illustrations. Price 6s. Presented by the Publishers.*

**Limnology.** *Die Natur* **48** (1899): 487–489. **Ule.**
Der praktische Wert der Seenforschung. Von Willi Ule.

**Meteorology.** *American J. Sci.* **8** (1899): 433–444. **Bigelow.**
Some of the results of the International Cloud Work for the United States. By Prof. Frank H. Bigelow.

**Meteorology.** *Quarterly J.R. Meteorolog. S.* **25** (1899): 305–317. **Schaw.**
On some phenomena connected with the Vertical Circulation of the Atmosphere. By Major-General H. Schaw, C.B.

**Meteorology—Pressure.** *C. Rd.* **129** (1899): 1290–1294. **Poincaré.**
Mouvements barométriques provoqués, sur le méridien du Soleil, par sa marche en déclinaison. Note de M. A. Poincaré. *With Diagrams.*

**Oceanography.** *Rev. G.* **45** (1899): 469–474. **Thoulet.**
Conférence de M. J. Thoulet: Le fond de la mer et les cartes lithologiques sous-marines. *With Illustrations.*

**Oceanography—Gulf Stream.** **Galitzine.**
*B.A. Imp. Sci. St. Pétersbourg* **9** (1898): 321–344.
Notes sur les limites du Gulf-Stream dans l'Océan Glacial Arctique. Par Pr. B. Galitzine. [In Russian.]

**Oceanography—Pacific Ocean.** *Science* **10** (1899): 833–841. **Agassiz.**
Cruise of the *Albatross.* By Prof. Alexander Agassiz.

**Volcanoes.** *P.R. Irish A.* **5** (1899): 392–432. **O'Reilly.**
On the Dates of Volcanic Eruptions and their Concordance with the Sun-Spot Period. By Joseph P. O'Reilly.
An elaborate discussion of volcanic activity and sunspot maxima, in which the conclusions of previous workers are discussed, and the general conclusion arrived at that the concordances are more numerous than the discrepancies.

## ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

**Anthropogeography.** **Meitzen.**
Abbildungen zu dem Vortrage: Die verschiedene Weise des Ueberganges aus dem Nomadenleben zur festen Siedelung bei den Kelten, Germanen und Slawen. Von Dr. August Meitzen. (VII. Internationaler Geographen-Kongress, Berlin, 1899.) Size 11½ × 9. 17 *Plates.*

**Anthropology.** ——

Ethnologisches Notizblatt. Herausgegeben von der Direktion des Königlichen Museums für Völkerkunde in Berlin. Band II., Heft I. Berlin: A. Haack, 1899. Size 10 × 7, pp. 76 and 72. *Illustrations.*

**Assyrian Customs.** **Sayce.**

The Semitic Series. Babylonians and Assyrians. Life and Customs. By the Rev. A. H. Sayce. London: J. C. Nimmo, 1900. Size 8 × 5½, pp. x. and 274. *Price 5s. net. Presented by the Publisher.*

On the life and customs of the Babylonians and Assyrians as revealed by inscriptions. The volume is the first of a series dealing with the Semitic nations, and embodying the latest results of archæological research.

## BIOGRAPHY.

**Böckh.** *Deutsche Rundschau G.* **22** (1899): 133–135. ——

Richard Böckh. *With Portrait.*

**Daly.** *B. American G.S.* **31** (1899): 398–400. ——

Ex-Chief Justice Charles P. Daly, LL.D.

**Dawson.** *Science* **10** (1899): 905–910. **Adams.**

Sir William Dawson. By Prof. Frank D. Adams. *With Portrait.*

**Fitch.** **Ryley.**

Ralph Fitch, England's Pioneer to India and Burma. His Companions and Contemporaries. With his remarkable Narrative told in his own words. By J. Horton Ryley. London: T. Fisher Unwin, 1899. Size 8½ × 6, pp. xvi. and 264. *Illustrations. Price 10s. 6d. net. Presented by the Author.*

A brief historical epitome of the beginnings of English expansion introduces a fuller description of the adventurous journey to India and Burma in the reign of Queen Elizabeth that prepared the way for the establishment of the East India Company; and after a biographical sketch of Ralph Fitch, the chief adventurer, the history concludes with a short chapter recalling the results which have followed this early enterprise down to the present day.

## GENERAL.

**Bibliography—Catalogue.** ——

Catalogue of the Printed Books and Manuscripts in the John Rylands Library, Manchester. 3 vols. Manchester: J. E. Cornish, 1899. Size 12 × 9½, pp. 1986. *Presented by the John Rylands Library.*

The John Rylands Library contains a large collection of theological works, but general literature is also represented.

**Bibliography—Index.** ——

Tables générales des Mémoires de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique (1772–1897). Bruxelles, 1898. Size 9 × 6, pp. 260. *Presented by the Academy.*

**Bibliography—Index.** ——

Tables générales du Recueil des Bulletins de l'Académie Royale des Sciences, des Lettres et des Beaux-Arts de Belgique. 3me Série. Tomes i. à xxx. (1881 à 1895). Bruxelles, 1898. Size 9 × 6, pp. 318. *Presented by the Academy.*

**Book of Reference.** **Trübner and Mentz.**

Minerva. Jahrbuch der Gelehrten Welt. Herausgegeben von Dr. K. Trübner und Dr. F. Mentz. Neunter Jahrgang, 1899–1900. Strassburg: Karl J. Trübner, 1900. Size 6½ × 4½, pp. xxxii. and 1161. *Portrait.*

**Geography of Book-buyers.** ——

Letters to the publishing department of the *Times* about the Century Dictionary. With a Map. Size 9½ × 4½, pp. vi. and 74. *Presented by the Publishers of the 'Times.'*

Interesting for the map, which shows the number of purchasers of the edition of the 'Encyclopædia Britannica' published in 1875–88 and reprinted without alteration in 1899, according to their distribution in the United Kingdom.

**Military Geography.** **Maguire.**

Outlines of Military Geography. By T. Miller Maguire, LL.D. Cambridge: the University Press, 1899. Size 8 × 5½, pp. x. and 360. *Maps, Plans, and Illustrations. Price* 10*s.* 6*d. Presented by the Cambridge University Press.*

This book is noticed specially in the present number.

**Paradox.** **Breach.**

Twenty reasons against Newtonianism, with Twenty Geographical Proofs that the Earth is an Extended Plane. By Ebenezer Breach. Southsea: S. Phillips. Size 7 × 5, pp. 16. *Price* 2*d. Presented by the Author.*

This curious result of imperfect education might be useful to teachers as a storehouse of fallacies which could easily be answered by a class in practical geography.

**Photography.** **Arbery.**

Hand Book of Military Photography. By Sub-Conductor C. J. Arbery. Simla, 1899. Size 6½ × 4, pp. 10 and 30. *Illustrations. Presented by the Intelligence Branch, Simla.*

This little book deals only with the mechanical work of using a camera, developing negatives, and making prints. It does not deal with the selection of points of view, exposure, emergency photography with pin-hole camera, or the like.

**Travelling.**

In Journeyings Oft. Chapters by Various Missionaries on Travelling in Foreign Lands. With Preface by the Right Rev. the Bishop of Athabasca. London: Church Missionary Society, 1900. Size 8½ × 7, pp. vi. and 104. *Illustrations. Price* 1*s.* 6*d. Presented by the Church Missionary Society.*

Notes by missionaries on modes of travelling in various out-of-the-way parts of the world.

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## NEW MAPS.

**By J. COLES, *Map Curator*, R.G.S.**

### EUROPE.

**Bavaria.** **Aventin.**

Aventins Karte von Bayern, MDXXIII. Im Auftrage der Geographischen Gesellschaft in München zur Feier ihres dreissigjährigen Bestehens herausgegeben und erläutert von Dr. Joseph Hartmann. Mit einem Vorwort von Prof. Dr. Eugen Oberhummer. München, 1899. *Presented by Geographische Gesellschaft.*

The original of this map of Bavaria was printed in 1523, and is the work of Aventin, the first Bavarian historian. It was discovered at the beginning of the nineteenth century by Baron von Aretin in the monastery at Tegernsee, but seems to have been forgotten until 1843, when it was deposited in the library of Munich; and it is only now, after this lapse of time, that, by the favour of General von Lobenhoffer, a reproduction has been allowed to be published.

The map is accompanied by full explanatory letterpress and a facsimile reproduction of the original dedication.

**England and Wales.** **Ordnance Survey.**

**Publications issued since January 8, 1900.**

**6-inch—County Maps:—**

ENGLAND AND WALES (revision):—**Derbyshire**, 13 N.W., 28 S.E., 29 S.W. **Hertfordshire**, 32 S.E. **Sussex**, 29 S.W., 32 N.W., 43 N.E., 44 S.W., S.E., 57 N.E., 58 N.W., S.E., 80 S.W. **Westmorland**, 4 S.W., S.E., 29 S.E., 32 N.W., N.E. 1*s. each.*

**25-inch—Parish Maps:—**

ENGLAND AND WALES (revision):—**Berkshire**, VI. 3; XII. 11, 15, 16; XXXIII. 3, 4; XXXVII. 4. **Bucks**, XII. 16; XIV. 15, 16; XV. 16; XVIII. 1, 3, 4, 6, 8, 9, 12, 13; XIX. 2, 3, 4, 5, 6, 7, 8, 9, 12; XX. 1, 2, 3, 4, 5, 7, 8, 11, 12, 15; XXIV. 3; XXV. 9, 14. **Cumberland**, XLV. 5; XLIX. 14; LIII. 16; LVIII. 1; LXVII. 2. **Denbighshire**, III. 4; IV. 11; VII. 4, 15; VIII. 1, 9, 13; XII. 4, 12; XIII. 5, 9, 13; XIV. 15; XVII. 2, 4, 15, 16; XVIII. 7, 8, 12, 13; XIX. 6, 15, 16; XXIV. 4, 12; XXV. 1, 2, 3, 4, 6, 7, 8, 13; XXVI. 1, 9; XXVIII. 2, 3; XXXIII. 7; XXXIV. 13; XXXV. 13, 14; XLIII. 2, 7. **Glamorganshire**, X. 3; XXVII. 6.

11, 14, 16; XXXV. 4; XXXVI. 9, 10, 14; XLII. 5. **Nottinghamshire**, IX. 15; XV. 1, 3, 5, 7, 8, 10, 11, 12, 13, 15, 16; XVI. 5, 9, 13, 15; XX. 1, 2, 4, 6, 14, 16; XXI. 1, 3, 4, 10, 11, 14; XXIV. 3, 4, 6. **Oxfordshire**, XI. 16; XIII. 16; XV. 14; XVI. 14; XVIII. 9; XXII. 1, 5, 8; XXIII. 1, 2, 3, 5, 7, 9, 13, 15; XXXIX. 3; LVIII. 4. **Staffordshire**, X. 16; XI. 6, 11; XIV. 8, 15; XVIII. 3, 8; XIX. 10, 11. **Wiltshire**, IIA. 14; II. 11; IV. 4, 7, 11; V. 1, 3, 5, 6, 10, 12, 15; VI. 2, 5, 10, 14; IX. 1, 2, 3, 4; XI. 11, 15; XXIII. 6, 8; XXX. 3. *3s. each.*

Miscellaneous:—County Diagrams, scale 2 miles to 1 inch, printed in colours, showing unions, sanitary districts, boroughs, and civil parishes, also the $\frac{1}{2500}$ scale sheet-lines, viz. Brecknockshire, Carnarvonshire, Merionethshire, Pembrokeshire, and Worcestershire. *Price 3s. each.*

(*E. Stanford, Agent.*)

**Switzerland.** **Swiss Federal Staff.**

Topographischer Atlas der Schweiz im Massstab der Original-Aufnahmen nach dem Bundesgesetze vom 18 Dezember 1868 durch das eidg. topogr. Büreau gemäss den Direktionen von Oberst Siegfried veröffentlicht. XLVIII. Lieferung. Nr. 275, Alpbella; 302, Montricher; 416 *bis*, Gross Litzner; 417 *bis*, Martinsbruck; 421 *bis*, Reschenscheideck; 431 *bis*, La Cure; 432, Arzier; 451, Genève; 452, Jussy; 453, Carouge; 478, Pillon; 501 *bis*, Crodo. *Price 1 mark each sheet. Presented by the Swiss Federal Staff.*

## ASIA.

**China.** **Bretschneider.**

Map of China and the surrounding regions. Scale 1 : 4,371,840 or 69 stat. miles to an inch. By E. Bretschneider. To illustrate the author's 'History of Botanical Discoveries in China.' Engraved and printed by A. Iliin, St. Petersburg, 1900. 4 sheets. *Presented by the Author.*

This is the second edition of a general map of China on which many of the routes followed by travellers are laid down. The importance of towns is indicated by symbols, and the type in which their names are printed. A full explanation of the symbols employed is given, as well as of some of the Chinese geographical terms.

**China.** **Cordes.**

Übersichts-Skizze der Wasserstrassen West-China's. Zusammengestellt nach E. Bretschneider's Karte von China. Scale 1 : 5,000,000 or 78·6 stat. miles to an inch. With a pamphlet. "Handelsstrassen und Wasserverbindungen von Hankau nach dem Innern von China," von H. Cordes. Berlin, 1899. E. S. Mittler und Sohn.

**China.**

Imperial Railways of North China, 1899. *Presented by W. R. Carles, Esq.*

**Indian Government Surveys.** **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 94, parts of districts Khamamet (Nizam's Dominions), of Kistna, Godavari and Vizagapatam (Madras Presidency) and Bastar State (Central Provinces), additions to 1899; 102, parts of districts Gorakpur and Basti (N.W. Provinces), Saran Champaran, and Muzaffarpur (Bengal), and Nepal, additions to 1897; 120, parts of districts Nadia, Burdwan, Jessore, Faridpur, Dacca, Murshidabad, Rajshahi, Mymensingh, Birbhum, Malda, Backergunge, and Pabna (Bengal), additions to 1897.—Quarter-Sheets: 31 N.W., parts of districts Ferozepore, Montgomery, Lahore, and of Native States Bahâwalpur (Punjab), and Bickaneer (Rajputana)': 53 S.E., parts of districts Hoshangabad and Betul (Central Provinces) and the Native States of Bhopal and Holkar (C. I. Agency), additions to 1897; 126 S.W., parts of districts Hoakháli, Tippera, Dacca, Backergunge (Bengal) and Hill Tippera (Native State), additions to 1898.—Bombay Survey, 1 inch to a mile. No. 165, districts Colába and Poona. Season 1880–81, additions to 1898; 350, District Bijapur. Season 1895–96, 1899, 351, district Bijapur. Season 1895–96, 1899.—Central India and Rajputana Survey, 1 inch to a mile. No. 307, parts of district Nimár (Central Provinces) and Native State of Indore and Dhar (C. I. Agency), Seasons 1867–68–69–70 and 1876. 1899.—South Eastern Frontier, 4 miles to an inch (2nd edition) No. 2 N.W., parts of districts Chittagong (Bengal) Northern Arakan and Akyab (Lower Burma), and Chin Hills and Parokku (Upper Burma). Seasons 1853–61 and 1883–97. 1898.—Sind Survey, 1 inch to a mile. Nos. 19, 19A and 37, 20, 37A, 38, 57, 57A, part of Kalát (Baluchistan), and district Dera Gházi Khán (Punjab) Season 1897–98. 1899. Nos. 95, 95A; District Dera Gházi Khan (Punjab), Season 1897–98. 1899.—Bombay Presidency (exclusive of Sind), 32 miles to an inch, additions to 1899.—The Provinces of Bengal, Bihar, Orissa, and Chota Nagpur, 32 miles

to an inch, 1899.—District Chittagong (Bengal), 4 miles to an inch, additions to 1898. 2 sheets.—District Dinájpur, Lower Provinces, Bengal, 4 miles to an inch, additions to 1897, District Hissar, Punjab, 4 miles to an inch, 1899.—District of Amraoti, 8 miles to an inch, 1899.—District Dera Gházi Khán, Punjab, 16 miles to an inch, 1899.—District of Ellichpur, Hyderabad Assigned Districts, 8 miles to an inch, 1899.—District Kángra, Punjab, 12 miles to an inch, 1899.—District Ráwalpindi, Punjab, 8 miles to an inch, 1899.—District Jubbulpore, Central Provinces, 8 miles to an inch. Corrections to 1899.—District Nágpur, Central Provinces, 8 miles to an inch, 1899.—District of Wun, Hyderabad Assigned Districts, 8 miles to an inch, 1899.—District Malda, Lower Provinces, Bengal (2nd edition) 4 miles to an inch, 1899.—Charts of Triangulation and Traverse: Sind, 2 miles to an inch. Nos. 37, 37A, 57A, 70, 89, 90, 91, 95, 95A, 107, 108, 109. Seasons 1896–98. 1899.—Himalaya, No. 332. Seasons 1885–88, 1899.—*Presented by H.M. Secretary of State for India, through the India Office.*

## AFRICA.

**Africa.** **Philip.**

Philips' New Map of Africa. Scale 1: 7,300,000 or 115 stat. miles to an inch. George Philip & Son, London and Liverpool.

**Congo Free State.** **Wauters.**

Carte de l'État Indépendant du Congo. Scale 1: 5,000,000 or 78·9 stat. miles to an inch. Dressée par A. J. Wauters. Bruxelles: Librairie Falk Fils, 1899.

**German South-West Africa.** **Langhans.**

Beiträge zur Kenntnis der deutschen Schutzgebiete Nr. 17. Verbreitung der Buren in Deutsch-Südwest-Afrika, nach den statistischen Aufnahmen von 1899 von Paul Langhans. Petermann's Geographische Mitteilungen, Jahrgang, 1900. Tafel 3. Gotha: J. Perthes, 1900.—*Presented by the Publisher.*

**Transvaal.** **Jeppe.**

Jeppe's Map of the Transvaal, or South African Republic, and surrounding territories. Compiled from surveys by F. Jeppe and G. F. W. Jeppe, Pretoria, South African Republic, 1899. Lithographed by Wurster, Randegger & Cie (J. Schlumpf), Winterthur, Switzerland. Scale 1: 476,000 or 7·3 stat. miles to an inch. 6 sheets.

This is a new edition of Jeppe's map of the Transvaal and surrounding territories. It is drawn on a larger scale than the 1889 edition, but does not embrace so large an area. The present issue is printed on linen, and consists of six sheets.

**Transvaal.** **Johnston.**

Pictorial Bird's-eye Map of the Transvaal, Orange Free State, Natal, etc. W. & A. K. Johnston, Edinburgh and London, 1900. *Price* 6*d.* *Presented by the Publishers.*

## PACIFIC OCEAN.

**Samoan Islands.** **Langhans.**

Spezialkarte der Samoa-Inseln von Paul Langhans. Gotha: Justus Perthes, 1900. *Price* 1 *mark.* *Presented by the Publisher.*

## ATLANTIC OCEAN.

**Atlantic Ocean.** **Petermann's Geographische Mitteilungen.**

Nordatlantischer Ozean. I. Tiefenkarte: Nordatlantischer Ozean. II. Temperatur. *Petermann's Geographische Mitteilungen* Jahrgang 1900. Tafels 1, 2. Gotha: J. Perthes, 1900. *Presented by the Publisher.*

**Azores.** **Thoulet.**

Carte Bathymétrique des Iles Açores, d'après les cartes françaises et anglaises, les sondages du *Talisman*, du *Challenger*, de S. A. S. le Prince de Monaco (*Hirondelle* et *Princesse Alice*) et de "l'Açôr." Par M. J. Thoulet, 1899. Paris: Imprimerie Vieillemard Fils et Cie. *Presented by S. A. S. le Prince Albert de Monaco.*

On this chart the soundings taken at the Azores, under the direction of the Prince of Monaco, as well as those of the *Challenger*, *Talisman*, and other vessels, are laid down. The soundings are given in metres; the depths of the ocean from 500 to 3000 metres are indicated by a series of contours and different shades of blue.

## GENERAL.

**World.** **Langhans.**

Justus Perthe's Alldeutscher Atlas. Bearbeitete von Paul Langhans. Mit Begleitworten: Statistit der Deutschen und der Reichsbewohner. Gotha: Justus Perthes, 1900. *Price* 1 *mark. Presented by the Publisher.*

**World.** **Vivien de Saint Martin and Schrader.**

Atlas Universel de Géographie. Ouvrage commencé par M. Vivien de Saint Martin et continué par Fr. Schrader. Paris: Librairie Hachette et Cie. Sheet: 32, Autriche-Hongrie. *Price* 2 *fr.*

## CHARTS.

**Admiralty Charts.** **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, November and December, 1899. *Presented by the Hydrographic Department, Admiralty.*

| No. | Inches. | |
|---|---|---|
| 3073 to 3084 | | Tidal streams:—Coast of Scotland. *Each* 4*d.* The same 12 charts bound together in an atlas. 5*s.* |
| | 30 m = 6·0 | England, south coast:—Plymouth sound and Hamoaze. 5*s.* |
| 3101 | m = 1·5 | Norway, west coast:—Atleö to Batalden, including the entrance to Stavfiord. 2*s.* 6*d.* |
| 3105 | m = 0·6 | Norway, west coast:—Trondhjem fiords. 2*s.* |
| 3046 | m = 5·9 / 8·9 | Newfoundland:—Bay Bulls, Cape Spear. 1*s.* 6*d.* |
| 308 | m = var. | Plans in the Gulf of St. Lawrence:—Mount Louis bay, Magdalen river, Ellis bay, south-west-point of Anticosti and Salt Lake bay, Bear bay, East cape (Anticosti) (reproduction). 1*s.* 6*d.* |
| 3096 | m = 0·88 | United States, east coast:—Cape Cod bay. 2*s.* 6*d.* |
| 3089 | m = 3·6 | Brazil:—Port Aracajú. 1*s.* 6*d.* |
| 1306 | m = var. | Magellan strait, plans in Barbara channel, Smyth harbour, etc., Labyrinth islands, Hewett bay, North cove, Fury harbour, approaches to Bedford bay, Noir road (reproduction). 1*s.* 6*d.* |
| 558 | m = 1·5 | Magellan strait, plans on the south-west coast of Desolation and Santa Ines islands:—Discolation harbour, Latitude bay, Laura harbour, Week islands (reproduction). 1*s.* 6*d.* |
| 778 | m = 0·28 | United States, west coast:—Conception point to Point Pinos. 2*s.* 6*d.* |
| 1203 | m = 3·5 | Japan:—Uraga harbour. 1*s.* 6*d.* |
| 3109 | m = 4·0 | Japan:—Yokohama bay. 1*s.* 6*d.* |
| 2873 | | Anchorages in the Solomon islands, plans added:—Albatros bay, Austria sound, Lengo to Tetere. |

(*J. D. Potter, Agent.*)

### Charts Cancelled.

| No. | Cancelled by | No. |
|---|---|---|
| 1153 Mount Louis bay, Magdalen bay.<br>1150 East cape and Bear bay.<br>308 Ellis bay.<br>1147 South-west point and Salt Lake bay. | New sheet.<br>Plans in the Gulf of St. Lawrence . . . | 308 |
| 2113 Barbara channel.<br>1306 Ports in Barbara channel and Magdalen sound. | New sheet.<br>Plans in Barbara channel . . . . . | 1306 |
| 558 Ports in Desolation and Santa Ines islands.<br>1330 Week islands. | New sheet.<br>Plans on the south-west coast of Desolation and Santa Ines islands . . . . | 558 |
| 769 Plan of Challenger cove on this chart.<br>2657 Plan of Yokohama bay on this chart. | New plan.<br>Yokohama bay . . . . . | 3109 |

### Charts that have received Important Corrections.

No. 1698, England, south coast:—Dover bay. 1991, England, south coast:—Folkestone harbour. 1967, England, south coast:—Plymouth sound. 1914,

England, south coast:—Looe harbour. 1875, Germany, west coast:—Elbe, Weser, and Jade rivers. 2330, Norway, south coast:—Svenöer to Koster islands. 1974, Norway, south coast:—Jœlöen to Christiania. 72, Spain, west coast:—Port of Huelva, etc. 142, Strait of Gibraltar. 1520, Greece, east coast:—The Peiræus. 1661, Grecian archipelago:—Port Mudros. 2210, Plans in the Black sea. 444, Cuba:—Port Xagua. 410, Cuba:—Cárdenas and Sta. Clara bays, etc. 2840, British Columbia:—Haro strait and Middle channel. 655, India, west coast:—Port of Bombay. 833, Bay of Bengal:—Rangoon river and approaches. 2404, Singapore Main strait. 942A, Eastern archipelago, eastern portion. 2196, Anchorages in the southern part of Celébés. 943, Philippine islands. 2454, Philippine islands:—Luzon island, northern portion. 2809, Yang-tse-kiang:—Shanghai to Nanking. 1236, China:—Approaches to Port Arthur. 104, Korean archipelago, southern portion. 54, Ports and anchorages on the east coast of the Korea. 2672, Japan:—Hakodate harbour. 769, Pacific ocean:—Admiralty and Hermit islands. 1349, Anchorages in the Solomon islands. 191, Solomon islands:—Mboli harbour. 1414, Anchorage in the Solomon islands. 1829, Fiji islands to Samoa islands.

(*J. D. Potter, Agent.*)

**United States Charts.** **U.S. Hydrographic Office.**

Pilot Charts of the North Pacific Ocean for February, 1900, and of the North Atlantic Ocean for January, 1900. Published at the Hydrographic Office, Washington, D.C. *Presented by the Hydrographic Office.*

## PHOTOGRAPHS.

**Andorra.** **Southam.**

Four Photographs taken in the Republic of Andorra, by S. C. Southam, Esq. *Presented by S. C. Southam, Esq.*

(1) At Canillo; (2) Near Canillo; (3) Encamp; (4) Saldeou.

**Europe.** **Buxton.**

Forty-seven photographs of Albania, Servia, and Macedonia, by Noel Buxton, Esq., 1899. *Presented by Noel Buxton, Esq.*

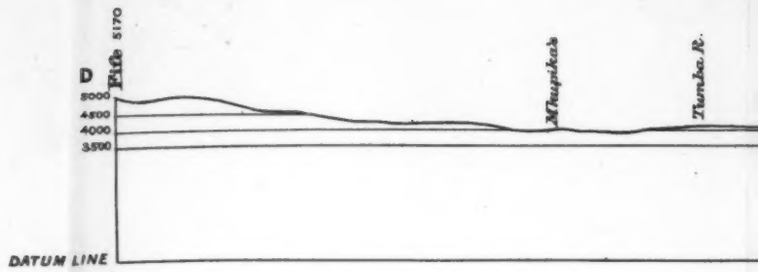
This series consists of forty-seven photographs, taken by Mr. N. Buxton during his travels in Albania, Servia, and Macedonia, chiefly illustrating scenes in the everyday life of the people. The following is a list of the titles:—

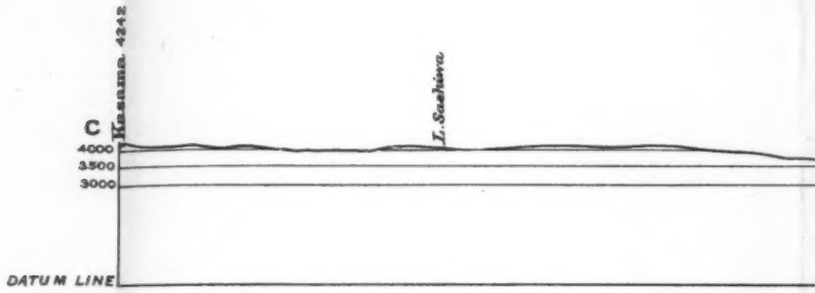
*Albania.*—(1) Chief street at Gilan; (2) Newly-married couple at Gilan; (3) Road near Gilan; (4) Servian wedding-party at Gilan; (5) Albanian Moslem wedding procession at Gilan; (6) Servian wedding, Gilan; (7) Band leading wedding procession at Gilan; (8) Novi Bazar; (9) Street in Novi Bazar; (10) Combined sewer and public bath at Novi Bazar; (11) Market at Novi Bazar; (12) Novi Bazar; (13) Cattle market at Novi Bazar; (14) Servian church at Novi Bazar; (15) The Mayor's house at Novi Bazar; (16) Albanian peasants near Novi Bazar; (17) Servian town of Rashka from Turkish side of frontier; (18) Between Rashka and Novi Bazar; (19) Albanian peasants and Servian dragoonman; (20) Albanian peasants; (21) Turkish regulars on Servian frontier; (22) Christians and half-built church at Mitrovitsa; (23) Priest and school at Mitrovitsa; (24) At Mitrovitsa; (25) Turkish pasha's house at Prishtina; (26) Zapties in Macedonia; (27) Servian ruins at Novo Bordo and Servian Consul; (28) Armed priest and Servian peasants at Novo Bordo; (29) Road near Novo Bordo; (30) Servian women in Albania; (31) Turks and Servians on the frontier at Rashka; (32) Church destroyed by Turks near Domorovtche; (33) Ex-brigands in Morihovo mountains.

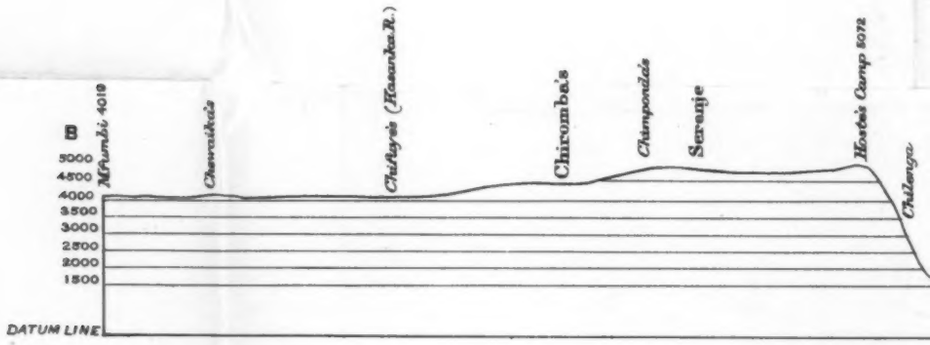
*Servia.*—(34) Chapel of Studenitsa monastery; (35) Abbot and priest with peasant threshing near Studenitsa; (36) Archimandrite Theodosius, Studenitsa; (37) Escort at a memorial fountain near Kruschewatz; (38) Market at Kruschewatz; (39) Fair at Kruschewatz, roasting whole sheep; (40) Vegetable market at Kruschewatz; (41) Camping for the fair, Kruschewatz; (42) Servian ruins of twelfth century, Ibar valley; (43) Servian ruins, Ibar valley; (44) Servian family coach.

*Macedonia.*—(45) The vintage near Monastir; (46) Vintage festival day near Monastir; (47) Escort from British fleet at Salonica.

**N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.**




SECTIONS A

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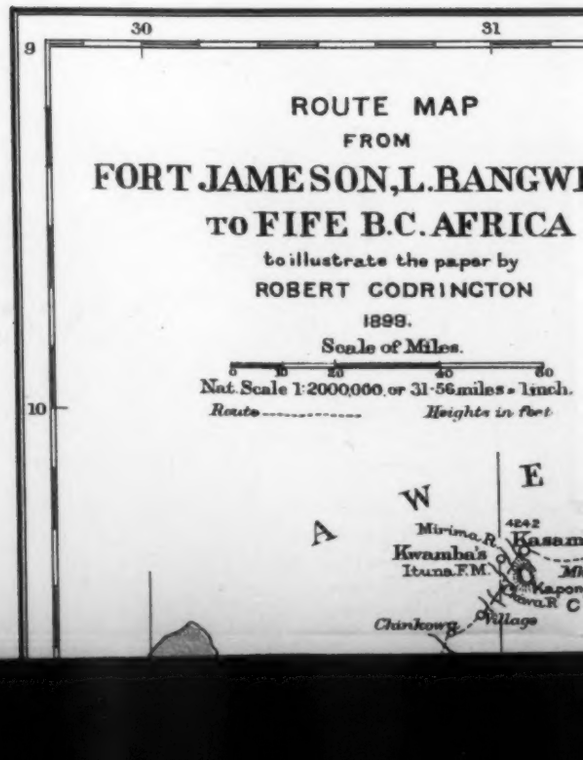

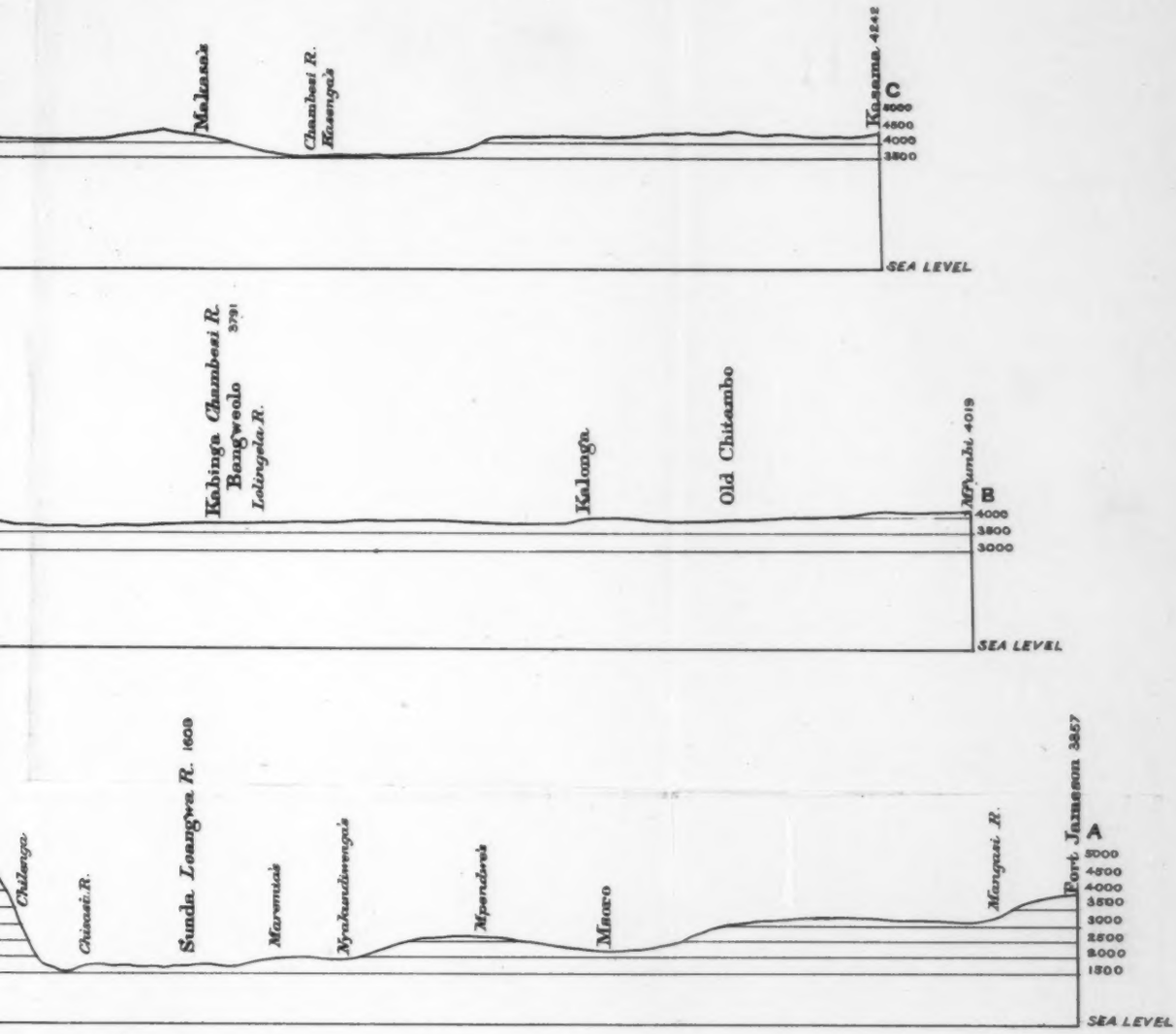


IS ALONG Mr CODRINGTON'S ROUTE.

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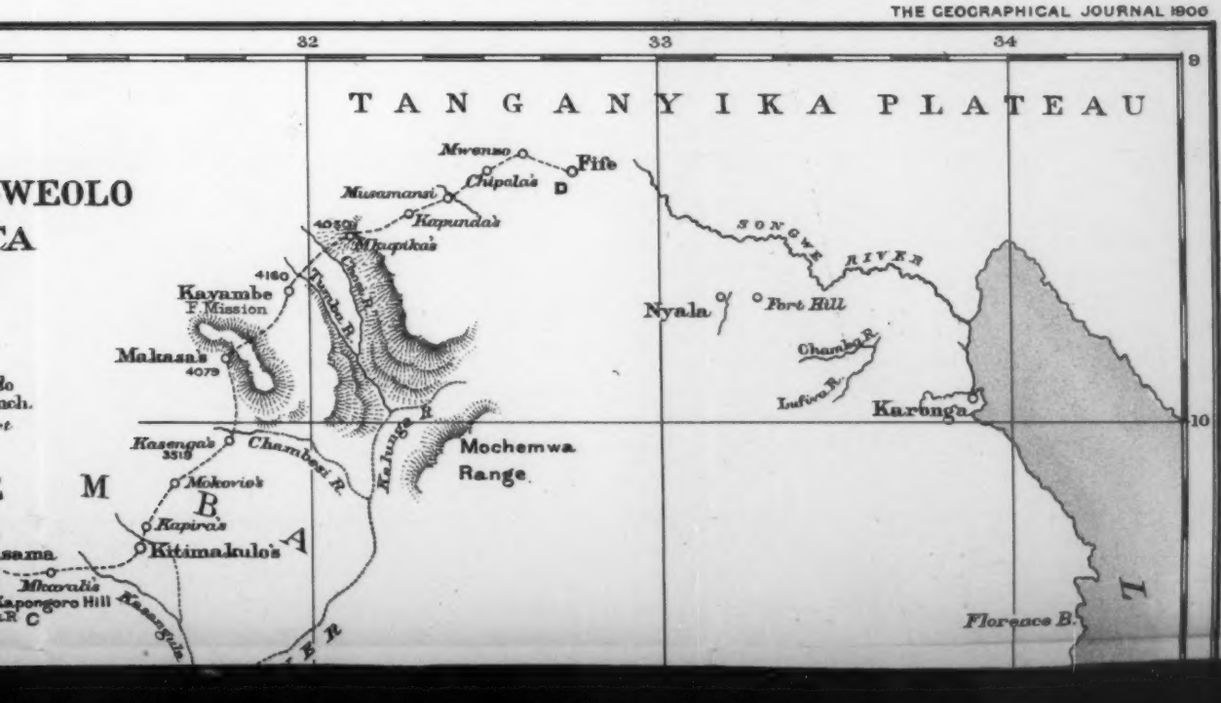

Route
Heights in
W
A
Mirima R.
Kwamba's
Ituna F.M.
Chinkowa
Village
Kaburibwi's
Chibanda's
Sashwa
Mtalekalawa's
Mutarisha
LAKE
BANGWEOLO
Kamfira's
Munusha R.
Mkwesha's
Luangenga R.
Luapula R.
Kabinga
3791
3830
Lolingela R.
Mirimo
Chipolo
3243
Munshasa R.
Chinemba
Konas
Lotikila R.
Lumbalwa R.
Chinto Chitambo
Lukulu R.
3829
Kalonga
Mchensha R.
Mafunas
Lulimala R.
Chitambo
Old Chitambo
3877
Luwe R.
Chuyakapeta
Manghira's
B
Mfumbi
Kafinda
Chewatka's
Chilisia's
Thalowa R.
4011
Lehombo R.
Kamba R.
Kasanka R.
Chifuye's
Kafuguas
4100
Chirom
4870
Manta
Ndowa
Mofinga
Kasur
Chimp
Malemba R.
4020
4830
Hostes' Ca
Chilen
MUCHINGA
LOANGWA
10
11
12
13
14
30
31

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34
35
DABŎRI
Famaka (Fort)
2110
Faxogi
Bahr el Azr
Aḍāru
R. Baba
11
R. Samha
R. Gorghe
Mt. Falughut
Khor Adāda
Mt. Fadogua
Ma Gāsaa
Abumāri
Tumat R.
Gamidi Sog
Mt. Ubi
Mt. Faronye
Mt. Tangi
Dist. Dis
R. Fafa
Rodokāt
Peaks
Abderrahman
Mt. Fadāmo
Jeberem
River Dabus
Bār
3757
3401
Mt. Gonfi
R. Afar
10
Mt. Belbisa
Gargora
R. Arrahi
Mendi
5401
Dembi
Mt. Behambisa
(Bambishi)
R. Komtsa
Fidila 5887
Mt. Tuluarba
Mona Sibu Dist.
Gori
Nago
Mt. Tulukorso
R. Dirki
Bojju
9
R. Owdi
Donkor
Siba
Rasgof
Bahr el Azraq
Dirdas
Plateau
BONDAR
Sokota
A F A
ARYSSINIA
Gulima
Rosaires
Dabus
Debra Tabor
Famaka
A M H A R A
Magdāla
Deszish
Adiuha
Mt. Falughut
Chok Plateau
Kaba
Abderrahman
Mt. Fademo
G O J A M
Morro Ficalo
Bowsha
Pashoda
Mt. Limmu
Abai or Blue Nile
S H O A
Debra Sinai
Mt. Chochi
Mt. Tuluarba
Angar
Kabbo
Angolala
Ancobar
Siban
Lekemti
ADDIS ABEBA
Sokod
Gaiama
Tukr Mts
Chevo Mts
Mt. Yugoff
Laga Hardim
Hawash
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38
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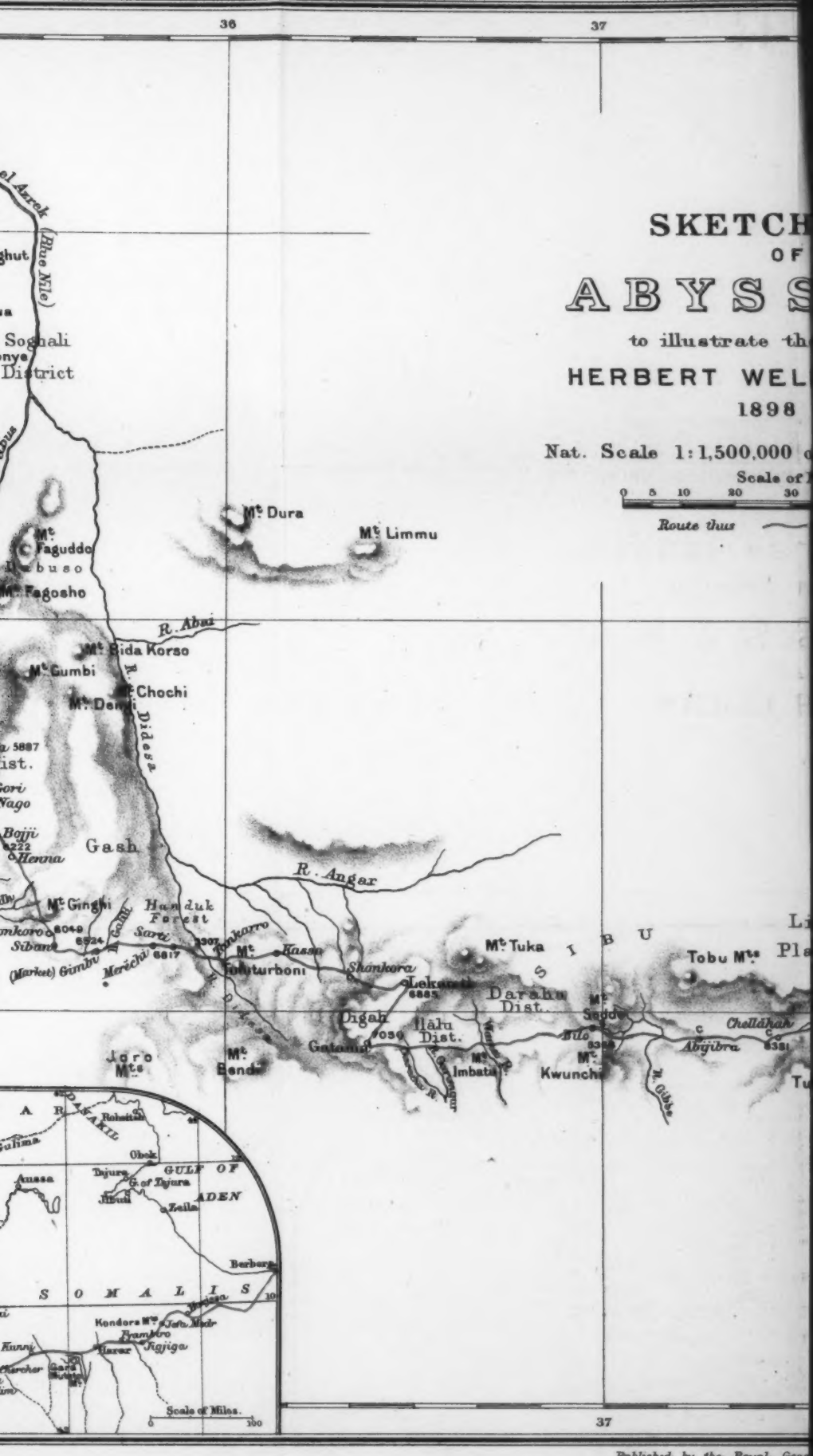


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